The role of parent-child relationship in children's emergent literacy in Hong Kong

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Abstract

The burgeoning research literature has shown that family variables are important in contributing to children's emergent literacy development. However, no compelling picture about the underlying mechanism and inconsistent findings about the extent of impact have emerged from the existing literature. In this present study, I address this knowledge gap by focusing on three related issues in order to unravel theoretical interplay among the structural components and hence the underlying mechanism of the developmental process of children's emergent literacy.

I propose a theoretical framework of hypothetical mediation structure for empirical testing. It posits that parent-child relationship quality (PCRQ) affects indirectly children's emergent literacy development through an intervening process captured by home literacy environment. Using systematic random sampling of a population, a total of 432 biological parent-child dyads (M=48 months; SD=2) from 19 international kindergartens across Hong Kong participated in this research study. Structural equation modeling with LISREL 8.80 was employed for evaluating the structural models. Results demonstrated that differential effects of different facets of home literacy environment on different domains of children's emergent literacy were robust. The hypotheses with home literacy resource as mediator were rejected. Although the results supported the hypotheses that two components of parent-child literacy interaction significantly mediated the relations between parent-child relationship quality and children's emergent literacy, the specific indirect effects were small and negative. By translating the present findings and integrating them with the insights from decades of rigorous science of child development, in particular, drawing on the recent advances in the field of developmental neuroscience, I develop a PCRQ Commitment Model to provide parents, policymakers and society with a more integrated picture about the total family process for optimization of child developmental outcomes in all aspects of child functioning and well-being including the development of children's emergent literacy beginning in the earliest years of life.

Declaration

I declare that this thesis embodies the results of my own work, that it has been composed by me and that it does not include work that has been presented for a degree in this or any other university. All quotations and the work and opinions of others have been acknowledged in the main text or footnotes.

Statement of Copyright

DEDICATION

To my wife Hau Ling and my children Eunice and Lucas,
who have taught me so much about children's emergent literacy development.

The LORD is my shepherd; I shall not want.
He makes me lie down in green pastures; He leads me beside quiet waters.
He restores my soul; He guides me in the paths of righteousness for His name's sake.

Even though I walk through the valley of the shadow of death, I fear no evil;
for You are with me; Your rod and Your staff, they comfort me.

You prepare a table before me in the presence of my enemies;
You have anointed my head with oil; My cup overflows.
Surely goodness and lovingkindness will follow me all the days of my life;
And I will dwell in the house of the LORD forever.

(Psalm 23)

ACKNOWLEDGEMENTS

By the grace of God, I have thoroughly completed my doctoral thesis. When I honestly reflect upon this experience, I am beginning to see that hardship and suffering can be beneficial because they help train our faith and endurance; and strengthen us for life ahead. I am grateful to God, for He has sovereignly orchestrated the production of what you are reading – through my family and the assistance of many other people.

Throughout this hard but fruitful journey, my family has been a continual source of support and abundant inspiration from the beginning to the completion of this doctoral research study. Apart from my precious wife and two lovely children, I must express my deepest gratitude to my parents Kam Shun and Chuen Ying who, in every way, have always been supportive towards my academic endeavor. I must thank my spiritual parents Wing Luk and Alice who, at every turn, have encouraged me and prayed for my spiritual growth in the Lord over the years. I also thank our church family and friends for our Sunday meetings of worship, prayer and teaching. I am especially thankful for the opportunities provided by our monthly meetings, where brothers in the '*good boy club*' gather to share our struggles in life and pray for each other in Christ.

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Chapter 1: Introduction

1.1. An overview

In the sociolinguistic environment of Hong Kong, a high level of language ability with sophisticated language use of literacy in English has long been seen as a desirable asset. Although the 155 years of British colonialism in Hong Kong does not make English the *lingua franca* of this city, English is no longer considered as a '*foreign*' language (Cheng, 1997). At societal level, it has become a habitus of the people of Hong Kong and '*it has become part and parcel of the Hong Kong identity*' (Chan, 2002: p.281). Not only that it is fundamental to the common law system that the society of Hong Kong has always prided itself on having such a well-developed legal system, but also that it is a characteristic of Hong Kong (Cheng, 1997; and Chan, 2002). It is widely recognized that a high level of language proficiency in English is essential to maintain Hong Kong's role as an international center of commerce and as a hub for trade and services for China and the Pacific Rim. In other words, sacrificing English standard will endanger the Hong Kong's legal system and its global competitiveness and hence damage its identity as an international financial center. At individual level, the proficiency in English language has been equated by parents and students in Hong Kong as the principal determinant for upward and outward social mobility towards the ranks of middle class in an increasingly cosmopolitan Hong Kong (So, 1992; and Evan, 2000). Based on Bourdieu's (1986) notion of various forms of capitals, Chan (2002) argues that, English language has already been transformed into both cultural[1] capital and symbolic[2] capital at individual level in the society of Hong Kong. The ability to acquire and use the 'legitimate' language (i.e. English), a cultural capital, enables one to advance up the socioeconomic ladder through the conversion of the cultural capital into economic capital and hence lead to future success. The English language has become a symbolic capital to most parents in Hong Kong with a firm belief that the lack of fluency in English language would jeopardize their children's future careers (Cheng, 1997; and Chan, 2002). Consequently, these perceptions of English language have been deeply rooted in the minds of Hong Kong people. The importance of early childhood literacy development in English has

[1] Cultural capital refers to various kinds of legitimate knowledge acquired mostly through education.

[2] Symbolic capital captures the more intangible aspects of prestige and honor.

been regarded as the single best investment for enabling young children to develop knowledge and skills that will likely benefit them for a lifetime.

In the children's early literacy[3] literature, preschool period has been widely recognized as a critical time for the development and acquisition of a child's literacy skills that are both essential and important for the child's life-long prospects because it provides a strong foundation for the child's academic motivation and performance throughout the subsequent formal schooling (Stevenson & Fredman, 1990; Entwisle & Alexander, 1996; Snow et al., 1998; Neuman et al., 2000; Dickinson & Neuman, 2006; and Baker, 2014a). This is not to suggest that children with low levels of early literacy skills cannot succeed in the subsequent formal school learning. Rather, because of the fact that our school systems mainly provide an aged-graded curriculum (i.e. not a skill-graded curriculum), it does suggest that early delays will be magnified at each additional step as the gap between what children bring to the curriculum and what the curriculum demands increases (Whitehurst & Lonigan, 1998). Understanding and promoting the development and acquisition of early literacy skills in preschool children are becoming increasingly more important for ensuring children's subsequent educational success and a central source of concern to both researchers and policymakers in developing effective emergent literacy intervention programmes.

Over the past few decades, many researchers in the field of children's early literacy development have been investigating how young children acquire early literacy skills and how these skills relate to their subsequent school success (Mason, 1980; Teale, 1986; Purcell-Gates, 1996; Whitehurst & Lonigan, 1998; Morrison & Cooney, 2002; Aram & Levin, 2004; and Morrison, 2009). Beyond the debates about different ways of promoting children's early literacy development, there is a general consensus that attention should be given to children's home and family variables as the central arena of early literacy development studies (Snow, 1983; Snow et al., 1998; and Aram, 2008). These home and family variables include home literacy environment such as home literacy resource and parent-child literacy interaction (e.g. parent-child shared storybook reading). Although empirical research studies have been demonstrating that these variables are important in contributing to children's early language and literacy development, many questions

[3] In this research study, the term 'literacy' refers to the more conventional forms of literacy that comprises reading and writing of texts in the English alphabetic writing system.

regarding the theoretical interplay among these variables still remain unanswered (Aram, 2008; Baker, 2014a and 2014b).

Since the mid-1990s, one critical debate in children's early literacy research literature concerns the effect of parent-child literacy interaction, particularly the parent-child shared storybook reading, on the development of children's emergent literacy. Although theory and empirical research suggest that parent-child literacy interaction such as parent-child shared storybook reading is important and has a positive impact on children's early literacy development, no compelling picture about the underlying mechanism and inconsistent findings about the extent of impact have emerged from the existing research literature. Two major independent meta-analysis studies conducted by Scarborough and Dobrich (1994) and Bus et al., (1995) have raised doubts about the unique importance and the extent of effect of parent-child shared storybook reading on children's early literacy development. While these inconsistent accounts reflect certain technical problems such as measurement issue and methodological issue etc. that remain to be addressed, a relatively new notion of quality with respect to the parent-child literacy interaction has received increasing attention in the field of children's early literacy research (Sutton et al., 2007). A knowledge gap still exists about how the quality of literacy interaction between parents and children is related to children's early literacy development and how parents can enhance the quality of literacy interaction with their children around books and hence promote their children's early literacy acquisition and development (Hood et al., 2008).

As parents are their children's first literacy agents, conventional wisdom has suggested that parents take a unique and important role in shaping developmental trajectories of children's early literacy growth (Morrison & Cooney 2002; Aram 2008; and Morrison 2009). Indeed, this is in line with the concept originated from socio-cultural framework (Bruner, 1972; and Vygotsky, 1978), which describes how children's social and cognitive developments occur in a social context through interaction with supportive, responsive and competent others. Stated simply, high quality parent-child interaction permeating all aspects of home environment demands the attributes of parents such as parental love, care and sensitivity for supporting appropriately and responding consistently to the moment-to-moment needs of their young children when parenting, which in turn, is embedded in a trustworthy relationship that exists between a parent and his/her child

(Hinde, 1979; and Bus & van Ijzendoorn, 1988). Effective parental supportiveness and responsiveness for young children's immature skills help them achieve higher levels of learning and self-regulation (Lindfors, 2008; and Morrison, 2009). As parent-child literacy interaction is only a part of the whole series of interactions (or history of interactions) between a parent and his/her child in daily life that constitute their underlying parent-child relationship, it makes sense to assert that the quality of parent-child relationship should form the basis for enhancing or hindering the quality of parent-child literacy interaction and hence contribute to the development of children's emergent literacy.

Perhaps, one of the major reasons for the inconsistent research findings over the years is that most research on children's early literacy development has ignored the impact of parent-child relationship quality on parent-child literacy interaction. Future research on children's emergent literacy development should be geared to examining how the parent-child relationship quality may influence different facets of the home literacy environment, especially the occurrence of parent-child literacy interaction, and thereby contribute to the development of children's emergent literacy. In addition, since most research studies on the development of children's early literacy have been conducted with English-speaking children learning an alphabetic writing system in the Western countries or regions (Aram, 2008), a study on the role of parent-child relationship in the development of children's early literacy in a variety of cultures will definitely broaden and deepen our understanding about the acquisition of children's early language and literacy skills and thereby advance the existing knowledge of children's emergent literacy development.

1.2. The problem statement and this research study

How does the parent-child relationship quality influence the development of children's emergent literacy? In other words, by what means does the parent-child relationship quality exert its effect on the development of children's emergent literacy? This is the fundamental research question to be addressed in this thesis. There are, at least, three major related issues identified in the children's early literacy research literature. While the ultimate goal of this research study is to investigate how the quality of parent-child relationship affects the home literacy environment and thereby fosters or hinders the development of children's emergent literacy, I attempt to explicitly address these issues and thereby provide relevant findings that will contribute to the research literature.

First, the basic problem concerns a structural issue that requires a more coherent conceptualization on the connections between parent-child relationship quality and the other literacy-related factors of young children in the home environment, which serves to depict a more comprehensive picture for understanding parent-child relationship quality and its interplay with home literacy environment and hence the development of children's emergent literacy. Although there are other family factors such as parental education, parental occupation and family income level etc. that have been found to moderately correlate with children's emergent literacy outcomes even as children mature (Leseman & de Jong, 1998; Burchinal et al., 2002; and Zucker & Grant, 2007), I do not explore them directly in detail in this present study because these are areas which educators cannot practically influence. Instead, I examine mainly the domains of home literacy environment where researchers and educators can foster directly the development of children's emergent literacy or influence changes at home. Therefore, within the scope of this research study, I have restricted my focus on four major interrelated components underlying the fundamental research question in an effort to contribute to the on-going discussion and the current knowledge about this important topic. They are children's emergent literacy, home literacy environment, parents and preschool children that are embedded in parent-child relationship as shown in Figure 1.1 below.

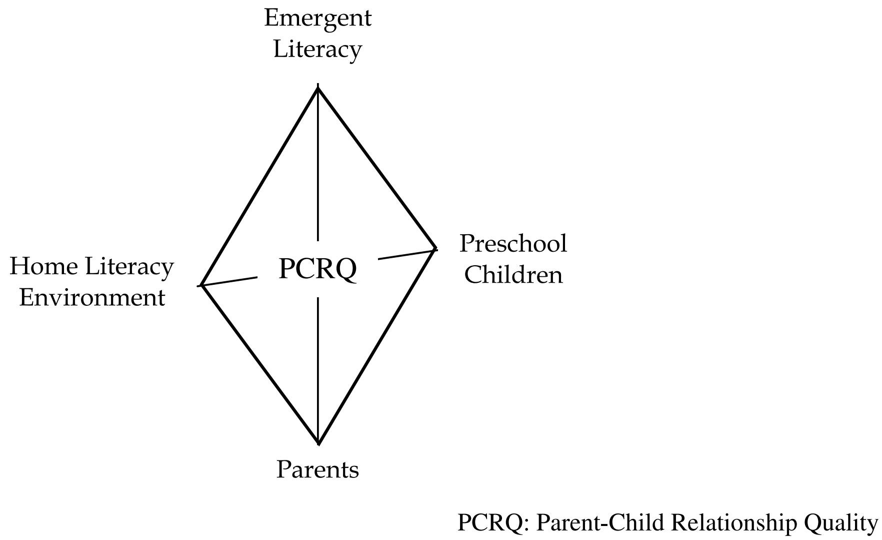

Figure 1.1: The four major interrelated components in the scope of this research study

In a review of the research literature in Chapter 2, I focus on examining both theoretical and empirical perspectives and thereby propose a theoretical framework that suggests a hypothetical mediation structure, which may underlie the developmental process of children's emergent literacy. Primarily, it postulates that parent-child relationship quality directly affects home literacy environment, which in turn, contributes to the development and acquisition of children's emergent literacy. In other words, it is important to take into account the indirect effect of parent-child relationship quality on the development of children's emergent literacy so as to increase our understanding of the underlying mechanism of the developmental process of children's emergent literacy. Based on the proposed theoretical framework, a total of twelve research hypotheses are formulated for empirical testing in this research study.

The second issue concerns the measurement issue. The theoretical constructs such as the parent-child relationship quality, home literacy environment and children's emergent literacy are abstract theoretical concepts that cannot be directly observed (or measured). They are called latent variables in the literature of statistical methods and they have to be operationalized for empirical studies. Generally, it can be done in many different ways. For example, if a survey is used as data collection method, questions (or items) in a questionnaire are the operationalized measures (observed variables) for corresponding theoretical constructs. These observed variables are sensitive to measurement errors.

The measurement errors in any empirical studies will affect the estimation of structural parameters and hence attenuate the effect size of one variable on another. Therefore, it is important that the measurement errors concerned are explicitly taken into account through an appropriate statistical analysis strategy in this empirical study.

The third issue is the methodological issue that concerns the choice of an appropriate statistical analysis strategy, which relates to both the structural issue and measurement issue as discussed above. In most empirical studies about the development of children's emergent literacy, traditional regression analysis is the common statistical method used to analyze a theoretical model that represents the relations between abstract theoretical concepts (e.g. Hess et al., 1984; Estrada et al., 1987; Bus et al., 1997; Mantizicopoulos, 1997; Bingham, 2002; Bracken & Fischel, 2008; Hood et al., 2008; Stephenson et al., 2008; Martini & Senechal, 2012; Baker, 2013; Skwarchuk et al., 2014; Senechal & LeFevre, 2014; and Yeo et al., 2014 etc.). Generally speaking, it is not a wrong method and it can also be applied to empirically analyze the hypothetical mediation structure in this research study. However, the traditional regression analysis has limitations and it has been criticized on multiple grounds, particularly through various simulation studies, that it has the lowest power to detect mediation effect (*if any*) (MacKinnon et al., 2002; Fritz & MacKinnon, 2007; MacKinnon et al., 2007; Iacobucci et al., 2007; Cheung & Lau, 2008; and Hayes, 2009). Stated simply, if the effect of an independent variable on a dependent variable is transmitted completely (or partially) through an intervening variable, traditional regression analysis is the least likely, among the statistical methods available, to actually detect the mediation effect. These methodological limitations (or weaknesses) may have masked the extent of effects of home literacy environment (e.g. parent-child shared storybook reading) on development of children's emergent literacy as debated in the research literature. Therefore, in this research study, I attempt to move beyond these limitations in order to unravel the theoretical interplay among the structural components and hence the underlying mechanism of the developmental process of children's emergent literacy.

In order to validate the proposed theoretical-conceptual model, it has to be tested on empirical data. Chapter 3 is devoted to research methods on sampling, data collection, sample characteristics, measuring instruments, questions and questionnaire design and choice of statistical analysis strategy. Structural equation modeling (SEM) is chosen as a preferred methodology for empirical testing of the hypothetical mediation structure in this present research study because it can deal with the above related issues flexibly and comprehensively. The arguments of preferring the SEM methodology to traditional regression analysis approach are discussed in further details in Chapter 3.

In Chapter 4, I examine the hypothetical mediation structures, particularly the indirect effects of parent-child relationship quality on children's emergent literacy development and hence investigate the underlying mechanism through empirical testing of the research hypotheses formulated in this present study. Data analyses include data screening and preparation, confirmatory factor analysis for evaluating the measuring instruments, and SEM with LISREL 8.80 for testing and evaluation of the proposed mediation structural models.

In Chapter 5, I summarize and discuss my research findings in light of the proposed theoretical framework and based on statistical analysis of the empirical data collected in this present research study. Then, I further translate the research findings and weave them together with the insights from decades of rigorous science of early childhood development, especially the recent advances in the field of developmental neuroscience, and hence develop a PCRQ Commitment Model that provides not only clear guidelines for parents in parenting for optimization of child developmental outcomes including children's emergent literacy development, but also appropriate recommendations for policymakers and society to promote healthy child development in young children. Finally, limitations of this research study and implications for future research are discussed thoroughly before presenting my concluding thoughts. I trust that the content of this thesis will provide a more comprehensive and integrative picture about the total family process of child development, in particular on how children's emergent literacy develops and hence how this developmental process can be enhanced for all young children beginning in the earliest years of life. More importantly, it will inform the important work of parents, policymakers and society at large to build a sturdier social infrastructure to support families in promoting healthy child development for all young children.

Chapter 2: Review of the Literature

2.1. The Sociolinguistic Environment of Hong Kong

In Hong Kong, Chinese ethnicity constitutes nearly 95% of the population with a speech community as virtually monolingual Cantonese-speaking society. However, from a sociolinguistic perspective, Bacon-Shone and Bolton (1998) argued that Hong Kong might be more accurately described as a '*multilingual society*', where speakers of the majority language (i.e. Cantonese) and speakers of minority "dialects" of Chinese also tend to report increasing degrees of fluency in both English and Putonghua (i.e. the national language of the Mainland China). Although the 155 years of British colonialism[4] in Hong Kong does not make English the *lingua franca* of this city, English language has the status of official language of the government and was *de facto* the most widely-used medium of secondary and university education.

Prior to 1974[5], English, as a 'colonial' language, was the only official language of the colonial government in Hong Kong. It was the official language of the law and its use was mostly restricted to high functions in tertiary education, the professions, industry, trade, business and finance. Given its important status and functions, English language was regarded as a symbol of power and privilege more than a means of communications in the early colonial rule of the territory, which was restricted to a minority of English-speaking officials, businessmen and professionals (Lethbridge, 1976; and Cheung, 1984). As such, a person with proficiency in English could enjoy privileges socially and politically.

Since 1960s, English has changed literally from a purely 'colonial' language to a language of wider communication in the territory (Pierson, 1992; and Johnson, 1994).

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[4] On 30 June 1997, Hong Kong ceased to be a British colony and became the Hong Kong Special Administrative Region (HKSAR), China.

[5] Since 1974, Chinese language has been established as the official language by the Official Languages Ordinance of Hong Kong, which established that Chinese would '*enjoy equality of use*' with English. The Basic Law of the Hong Kong Special Administrative Region (HKSAR), promulgated in 1990, further strengthens the position of Chinese language in the community. Article 9 of the Basic Law of HKSAR stated that: "*In addition to the Chinese language, English may also be used as an official language by the executive authorities, legislative and judicial organs of the Hong Kong Special Administrative Region*" (Chinese Government, 1992).

The knowledge of English language has been spreading throughout the population in Hong Kong at an unprecedented rate. The population census figures in Hong Kong indicate a rise in the proportion of the population claiming knowledge of English from 9.7% in 1961 to 43.0% in 2001 (Population Census: Main Report, 2001). Coupled with the socioeconomic development[6] of Hong Kong since the 1960s, the proficiency in English language has been equated by parents and students as the principal determinant for upward and outward social mobility towards the ranks of middle class in an increasingly cosmopolitan Hong Kong (So, 1992; and Evan, 2000).

According to Bourdieu (1986), while the main criterion in defining a person's social class is the person's economic situation or position in relation to the means of production, there are three other forms of capital: cultural, social and symbolic – that determine a person's social class. Cultural capital refers to various kinds of legitimate knowledge acquired mostly through education. Social capital consists of networks of relationships and symbolic capital captures the more intangible aspects of prestige and honor. These various forms of capitals are inter-convertible. For instance, increasing a person's cultural capital through acquiring the 'right' kind of knowledge in school can lead to a high-salaried job and thus converting his cultural capital gained into economic capital (i.e. material wealth). Based on Bourdieu's notion of various forms of capitals, Chan (2002) argued that, the English language has already been transformed into both cultural capital and symbolic capital at individual level in the society of Hong Kong. The ability to acquire and use the 'legitimate' language (i.e. English), a cultural capital, enables one to advance up the socioeconomic ladder through the conversion of the cultural capital into economic capital and hence lead to future success. The English language has become a symbolic capital to most parents and students with a firm belief that the lack of fluency in English would jeopardize their children's future careers (Cheng, 1997). Consequently, the importance and perception of English language have been deeply rooted in the minds of Hong Kong people.

Parallel with this sociolinguistic development in Hong Kong, English has emerged as the pre-eminent international language in commerce, science and technology in the international scene. In the case of Hong Kong, English is no longer a 'foreign' language

[6] Economically, Hong Kong has been transformed from a labor-intensive manufacturing economy to an emphasis on service-oriented industries in the 1980s and ultimately as a leading international financial centre and as a hub for trade and services for China and the Pacific Rim in the 1990s.

at societal level. It has become a habitus of the society and '*it has become part and parcel of the Hong Kong identity*' (Chan, 2002: p. 281). Not only that it is fundamental to the common law system that the society of Hong Kong has always prided itself on having such a well-developed legal system, but also that it is a characteristic of Hong Kong (Cheng, 1997).

Although the change of sovereignty in 1997 that signaled a transition from a colonial to a post-colonial society has marked a move of the official language policy towards the promotion of Chinese language in a number of official domains, it is widely recognized that a high level of language proficiency in both Chinese and English languages is essential to maintain Hong Kong's role as an international center of commerce and as a hub for trade and services for China and the Pacific Rim. In fact, one of the long-term aims of the HKSAR government is to help the next generation become biliterate in both Chinese and English (Standing Committee on Language Education and Research, 2003). In particular, it is generally accepted that sacrificing the English standard will ultimately endanger the Hong Kong's legal system and its global competitiveness and hence damage its identity as an international financial center. Therefore, a high level of language ability and sophisticated language use of literacy in English in this new millennium have been increasingly seen as a desirable asset in Hong Kong.

2.2. Children's Emergent Literacy

Over the past few decades, the field of children's emergent literacy has evolved into a multi-disciplinary field of study that attracts researchers from various disciplines such as education, sociology, psychology and linguistics etc. One area of study in the field of children's emergent literacy has focused on examining how preschool children's early literacy exposure and experiences in the home environment promote the development of their early reading and writing skills. Despite the fact that a substantial body of knowledge has been generated over the years regarding how the earliest environment promotes children's emergent literacy development and hence contributes to the successful development and acquisition of their later literacy skills, a holistic synthesis of the knowledge from various disciplines is needed in order to produce a clearer and appropriate picture on how the development of preschool children's reading and writing skills occurs in the home environment.

In the literature of reading science and child development, research has shown that children's abilities to read and write proficiently can vary dramatically even at the same-age level (Stanovich, 1986; Cunningham & Stanovich, 1998; Whitehurst & Lonigan, 1998; Lonigan et al., 2004; Lonigan, 2006; and Martini & Senechal, 2012). This means that even for those normally developing children at the same-age level, they can experience different levels of difficulties in learning to read and write successfully despite the fact that we all live in a literate society. For instance, a recent national study from the USA's National Assessment of Educational Progress (NAEP) has shown that only 35% of all fourth-grade children in the United States performed at or above the proficient level in reading and 32% performed below the basic level in reading (National Center for Education Statistics, 2013). Besides, the results of NAEP have revealed that the percentage of children who are performing at proficient levels in reading has remained constant across years.

Children who learn to read *earlier* and without experiencing significant difficulties tend to become more avid readers than those who learn to read *later* and experience difficulties in learning to read (Nagy & Anderson, 1984; and Lonigan, 2006). Children who are avid readers tend to read more and learn more, which in turn, further consolidate and expand their literacy skills and hence read even better (i.e. *reading success*) (Stanovich, 1986;

Cunningham & Stanovich, 1998; and Lonigan, 2006). The effect of substantial differences in the volume of reading exposure and experience among children of the same-age level may lead to "*Matthew effects*" in reading development (Stanovich, 1986). The concept of Matthew effects is based on the findings by Walberg and Tsai (1983), which asserts that individuals who have *early* advantageous educational experiences can utilize new educational experiences more efficiently (i.e. at a faster rate). In the context of children's reading development, it reflects a cumulative advantage phenomenon where the "*rich-get-richer*" (i.e. the avid readers) or the other side of the coin, the "*poor-get-poorer*" (i.e. the less skilled readers). Children with poorer reading skills tend to struggle continuously with reading and writing throughout their school years (Francis et al., 1996; Torgesen & Burgess 1998; and Torgesen et al., 2001) and into adulthood (Lonigan et al., 2004). They may acquire negative attitudes toward reading (Oka & Paris, 1986; and Cunningham & Stanovich, 1998) and hence read less and acquire less content knowledge and other language skills than their peers who are better-skilled readers (Allington, 1984; Brown et al., 1996; Stanovich, 1986; Echols et al., 1996; Torgesen et al., 1997; and Cunningham & Stanovich, 1998). Therefore, they tend to fall behind much further than their literate peers in reading skills (i.e. *reading failure*) and other educational achievements (Stanovich, 1986; Chall et al., 1990; Torgesen et al., 1997; and Lonigan, 2006).

On the other hand, in the field of children's literacy acquisition and development, a growing body of research literature and evidence has been consistently highlighting the significance of preschool period for the development of children's emergent literacy that can ultimately contribute to the successful development and acquisition of children's later reading and writing skills (Blatchford et al., 1987; Wagner et al., 1994; Bowey 1995; Badian 1998; Snow et al., 1998; Whitehurst & Lonigan, 1998; Catts et al., 1999; Storch & Whitehurst, 2002; de Jong & van der Leij, 2003; Lonigan et al., 2004; Fletcher et al., 2004; Lonigan, 2006; Phillips et al., 2009; and Martini & Senechal, 2012).

A book: "*Emergent Literacy – Writing and Reading*", launched by Teale and Sulzby in 1986, formally introduced the term "Emergent Literacy" as the development of reading and writing skills in children's earliest years of life, and heralded a new field of inquiry in the arena of early children's literacy development. Since then, the inquiry of children's emergent literacy has evolved into a broad field of study with multiple perspectives and a wide range of research methodologies (Whitehurst & Lonigan, 1998). Substantial efforts in the Western countries and regions have been directed systematically towards the understanding of development and contributions of children's emergent literacy, which represent the developmental precursors to conventional reading and writing skills (Snow et al., 1998; Whitehurst & Lonigan, 1998; National Institute of Child Health and Human Development, 2000; Catts et al., 2002; Justice et al., 2003; Lonigan et al., 2004; Lonigan, 2006; National Early Literacy Panel, 2005 and 2009). Research evidence has consistently revealed the fact that the origin of conventional literacy skills begins to develop in young children well before their formal schooling. In addition, research has shown that *prevention* of reading difficulties in children is far more efficient and cost effective than *remediation* (Snow et al., 1998; Torgesen, 2000; Lonigan et al., 2004; Coyne et al., 2004; and Phillips et al., 2009). The study of children's emergent literacy development has also been making important contributions in the arena of social policy in terms of early identification of those children at risk in developing literacy difficulties and early intervention necessary to break the cycle of literacy failure (Whitehurst & Lonigan, 1998; Lonigan et al., 2004; and Lonigan, 2006).

2.3. Defining Emergent Literacy

The emergent literacy perspective conceptualizes the phenomena of children's literacy acquisition as a developmental continuum of increasing competence that originates from the early life of children at birth (Whitehurst & Lonigan, 1998; Lonigan, 2006; and Evans & Shaw, 2008). It treats literacy-related behaviors occurring in the preschool period as authentic, legitimate and important aspects of literacy acquisition. It recognizes that *oracy skills* (listening and speaking) and *literacy skills* (reading and writing) develop concurrently and interdependently from the preschool age in children's exposure to social contexts and interactions where literacy is a component (Whitehurst & Lonigan, 1998; and Lindfors, 2008). Thus, a child's early engagement with print material (e.g. picking up a familiar picture storybook, turning the pages and re-telling a story in expressive voice) and writing implements (e.g. scribbles of invitation cards to grandfather or notes to parents) are considered as incidents of real reading and real writing. The preschool child is recognized as an emergent reader and an emergent writer, doing some things that accomplished readers and writers do. It is an early version of literacy abilities that will develop over time.

Most linguists believe that all individual languages possess important properties in common and therefore every individual language[7] is a combination of these *universal properties* with a number of accidental and often idiosyncratic features (Trask, 2007). Over the past few decades, researchers in many different countries have shown that the vast majority of children have acquired languages (whatever the particular language they are learning) through similar sequences and processes although language acquisition might differ in its specifics from child to child (Trask, 2007; and Lindfors, 2008). It has been established that early language acquisition proceeds through a sequence of well-defined continuous stages: cooing, babbling, the one-word stage (1^{st} year of age) and the two-word stage (2^{nd} year of age). Afterwards, particular constructions (e.g. questions and negation) are developed in a series of well-ordered stages that are highly consistent not only across young children but also across different languages.

[7] From a performance perspective, which refers to the real utterances produced by individual speakers on particular occasions, language invariably entails *expression* (whether oral or written or signed) of *meaning* to *someone* for some *purpose* (i.e. systematic meaning-expression relationships) and it infuses our social, intellectual, linguistic and aesthetic experience from birth (Lindfors, 2008).

Another great advance in the field of children's language development is the realization that early language acquisition is an active learning process rather than a mere passive "soaking" affair. Young children are actively constructing their language (or novel utterances) through the environmental clues available. They are using these clues to construct their own grammatical rules, which grow in sophistication as acquisition proceeds. They are able to discern and use patterns in both oral language and written language that they interact with and observe – figuring out the patterns and hence using them to create their own communications (Lindfors, 2008). For instances, two-month-old infants can recognize and differentiate sets of features between "person" and "objects" (i.e. person-object distinction) and respond to them quite differently (Trevarthen, 1977). A few months later, they can differentiate between "mother" and "not-mother" (i.e. mother-versus-other distinction) by seeking their mother and withdrawing from strangers. In the early months, children smile, gesture, cry and vocalize. These are treated as intentional communication by adults who respond again and again in specific ways – repeated scripts and routines that convey meanings. During the preschool period, children's oral language is developing and becoming more complete (e.g. various question forms), more complex (e.g. cause-effect and means-end relationships), more refined and more precise (e.g. categories and hierarchies), and more varied (e.g. purposes and styles). At the same time, their written language are emerging with their own unique ways of approaching environmental print and engaging text authentically (e.g. laughing and empathizing in their reading of print materials) and they come to a page with expectation to find language there. In the earliest stages of reading, emergent readers decode letters (in an alphabetic system) into corresponding sounds and link those sounds to single words (i.e. learning to sound out single words) although they still have not yet extracted the meanings from the phonological representation of the words (Whitehurst & Lonigan, 1998). Later in the process, children's semantic and syntactic abilities assume greater importance when they are learning to read for meaning by mapping the phonological code with the corresponding semantic representation (Mason 1992). Most studies on children's emergent writing have also converged on a common developmental pattern (Whitehurst & Lonigan, 1998). Scribbling some indecipherable marks on paper and learning to write letters are examples of emergent writing, which indicate that children know that print has meaning (Sulzby 1986). Early preschool children treat writing in a pictographic sense by using various drawings and scribble-like markings that seems meaningful only to themselves. In a later phase, they use different letters, numbers and letter-like forms to represent different things. In the late preschool period, children use letters to represent the individual sounds in words.

Continuities and connections between oral expressive system and written expressive system are crucial for children's literacy development (Vygotsky, 1986; and Lindfors, 2008). Figure 2.1 below illustrates the developmental continuum of children's emergent literacy. Since at birth, children have been continuously and actively communicating and tuning in to many different parts of the language systems (oral or written) of expressing meaning to someone for some purpose.

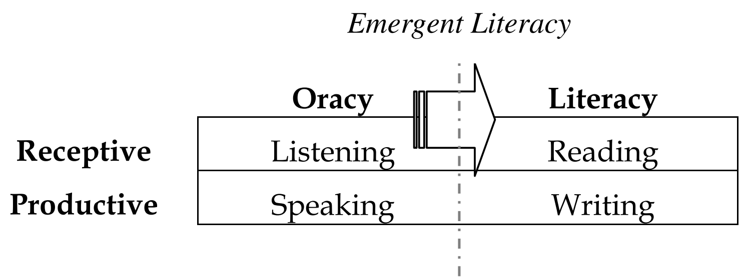

Figure 2.1: Emergent Literacy – A developmental continuum from oracy to literacy
(Source: Adapted from Baker, 2001)

Emergent literacy is a multidimensional construct that comprises different domains of emergent literacy skills and knowledge (Whitehurst & Lonigan, 1998; Scarborough, 2001; Lonigan, 2006; Evans & Shaw, 2008; and Massetti, 2009). A comprehensive definition of emergent literacy that refers to the characteristics of both emergent reader and emergent writer has been given by Whitehurst and Lonigan (1998: p.849): "*Emergent literacy consists of the skills, knowledge and attitudes that are presumed to be developmental precursors to conventional forms of reading and writing and the environments that support these developments*". Whitehurst and Lonigan (1998) surveyed and identified a series of component skills, knowledge and attitudes that constitute the domains of children's emergent literacy such as language (decoding, letters, sounds and words); convention of print; knowledge of letters; linguistic awareness; phoneme-grapheme correspondence; emergent reading; emergent writing; other cognitive factors and print motivation etc. Although theoretical and empirical synthesis about how these different components develop and influence each other (and hence their influence on the development of conventional forms of reading and writing) are still yet to mature, Whitehurst and Lonigan (1998) propose a model to synthesize these components into two independent sets of skills and processes for both emergent and conventional literacy: "*inside-out*" and "*outside-in*" as illustrated in Figure 2.2 below.

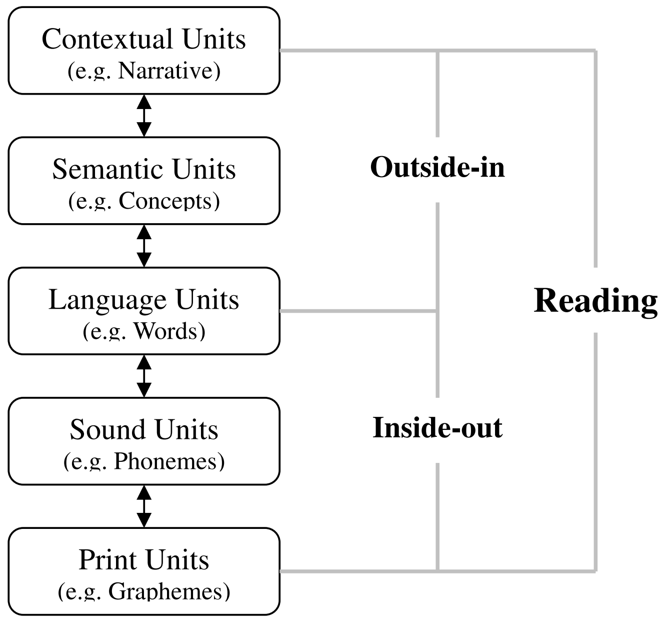

Figure 2.2: A model of the two sets of skills and processes for emergent literacy
(Source: Whitehurst and Lonigan, 1998)

The inside-out units represent the processes that children have to demonstrate their knowledge of the rules for translating the particular print into meaningful sounds in reading and meaningful sounds into print in writing (Whitehurst & Lonigan, 1998). A child, relying on the information within the printed word, has to translate print (e.g. letters and words) into the correct phonological representations when reading for decoding, and conversely he/she has to translate spoken words into print when writing. Inside-out skills reflect code-related components of reading (Lonigan, 2006). In other words, the child has to decode units of print into units of sound and units of sound into units of language when reading and these processes comprise alphabetic knowledge (i.e. letter names and associated letter sounds) and phonological awareness (i.e. awareness and ability to reflect on the sounds in spoken words) (Scarborough, 2001; Lonigan, 2006; and Evans & Shaw, 2008). However, a child having the requisite inside-out skills to read a written word (or a series of written words) aloud can only perform one part of the whole reading process because he/she has to comprehend the meaning of the print.

The outside-in units represent the processes that children have to demonstrate their understanding of the context in which the writing that they are trying to read occurs and the writing that they are trying to write occurs (Whitehurst & Lonigan, 1998). When a child is reading for comprehension, he/she has to depend on knowledge that cannot be found in the word or sentence (i.e. information from outside of the printed word or sentence) in order for him/her to derive meaning from it. The child is seeking to understand how the word (or sentence) makes sense within the context of the print. Outside-in skills reflect the more general abilities (e.g. language and general knowledge) that support comprehension (Lonigan, 2006). In other words, the child has to understand those auditory derivations, which involves placing them in the correct conceptual and contextual framework when reading and these processes comprise vocabulary, knowledge about print concepts, semantic and syntactic knowledge, knowledge of narrative structure and broader conceptual understanding (Whitehurst & Lonigan, 1998; Scarborough, 2001; and Evans & Shaw, 2008). As such, the child has to understand the knowledge of the world, semantic knowledge, and knowledge of the written context in which the particular word (or sentence) occurs.

Both the inside-out and outside-in processes are essential to reading and they work simultaneously in readers who are reading well (Whitehurst & Lonigan, 1998; and Evans & Shaw, 2008). Gough and Tunmer (1986) put forth simply that reading, as a process, is conceptualized as the product of decoding and comprehension working simultaneously, where decoding is the act of translating print into meaningful sounds and comprehension is the act of recognizing spoken words in print and their associated meanings and usages. Skilled reading is considered as a complex task that requires the coordination and interaction of many different domains of skills (Lonigan, 2006). These inside-out and outside-in processes are difficult to separate in a mature and skilled reader. However, it is evident that they are unlikely to be well-integrated in preschool children who are in the early stages of learning to read (Lonigan, 2006). With regard to preschool children, Whitehurst and Lonigan (1998) assert that the inside-out skills is the most important in the early sequence of learning to read when a child’s primary task is to develop accurate and fluent decoding skills (i.e. reading for decoding), whereas the outside-in skills become more important later in the sequence of learning to read when the child's task shifts to reading for comprehension.

In this research study, I focus on four core dimensions of emergent literacy that have been identified in literature as important developmental precursors in preschool children for the successful development and acquisition of later reading and writing skills. These are alphabet knowledge, phonological awareness, print concepts, and emergent writing. There is empirical evidence of the interdependence and predictive significance of these dimensions of emergent literacy on children's later literacy acquisition and development. They provide the foundation for preschool children in learning how to read and write and hence become proficient in conventional literacy.

2.3.1 Alphabet Knowledge

Alphabet knowledge (AK) is defined as preschool children's letter knowledge about individual letters' names and sounds (in both the uppercase and lowercase forms). Each letter in the alphabetic writing systems has one (or several) sound(s) associated with it and preliterate children must learn to associate the letters' names with their written symbols and acquire the sounds associated with the symbols (i.e. letter-sound knowledge), a critical index of children's early literacy development (Cabell et al., 2007).

Research has shown that children's alphabet knowledge before school entry is by itself predictive of their future reading achievement (Stevenson & Newman, 1986; Adams, 1990; Scarborough, 1998a; Treiman & Broderick, 1998; and Foulin, 2005). Higher level of alphabet knowledge (e.g. letter naming fluency) in preschool children reflects their thoroughness and confidence with letter names and other visual stimuli that can be labeled automatically and effortlessly (Adams, 1990; and Evans & Shaw, 2008). Besides, higher level of alphabet knowledge facilitates the learning of decoding and grapheme-phoneme correspondence (Treiman et al., 1998).

Empirical studies have revealed that some parents explicitly teach their children the letters' names and/or sounds and how to print them by using alphabet books (Haney & Hill, 2004; and Levy et al., 2006), which are often the first kind of books purchased by parents (Zeece, 1996). In an observational study, Bus and van Ijzendoorn (1988) has shown that by using alphabet books, parents' comments in reading to children tended to include naming letters, helping children to recognize letter sounds in words and connecting letters to words. In a recent study, Evans and Saint-Aubin (2008) suggest that alphabet books, when used by parents to highlight letters' names, sounds and shapes in their interactions with preschool children, are considered as a valuable resource for developing, consolidating and expanding children's alphabet knowledge.

2.3.2 Phonological Awareness

Phonological awareness (PA) is generally defined as preschool children's conscious awareness and oral language ability to analyze (i.e. perceive and deliberately manipulate) the sound structure (e.g. the basic speech units of phonemes, rimes, and syllables) of spoken language independent of the meaning of the language (Adams, 1990; Stackhouse & Wells, 1997; Schuele et al., 2007; Evans & Shaw, 2008; and Kirby et al., 2008). It has been widely acknowledged that the acquisition of phonological awareness is a crucial prerequisite and predictor of the acquisition of reading and writing skills and hence contributes to a child's later reading and writing success (Adams, 1990; Cunningham & Stanovich, 1993; Scarborough, 1998b and 2001; Storch & Whitehurst, 2002; Castles & Coltheart, 2004; Caravolas et al., 2005; and Kirby et al., 2008). A preschool child with good phonological awareness skills can rhyme words, say the beginning sound of a word, or even say each sound in a word (Schuele et al., 2007). Research has shown that children with good phonological awareness skills tend to be better readers than those with poor phonological awareness skills (Byrne & Fielding-Barnsley, 1995; and Torgesen & Mathes, 2000). Children, who are better at detecting syllables (i.e. least difficult), onset-rhymes, or phonemes (i.e. most difficult), are quicker to learn to read (i.e. decode words) (Wagner et al., 1994; and Whitehurst & Lonigan, 1998).

Some empirical studies have shown that the acquisition of phonological awareness skills in preschool children follow a universal developmental trajectory across children (Schuele et al., 2007) and across languages using alphabetic writing systems (Cossu et al., 1998; and Goikoetxea, 2005). The development of early emerging phonological awareness skills in preschool children starts from the awareness of larger linguistic units (i.e. the syllable structure) and implicit phonological awareness skills (e.g. identification and segmentation) to the awareness of smaller linguistic units (i.e. the onset-rhyme and phoneme units) and more cognitively demanding language tasks (e.g. blending and manipulation) (Treiman & Zukowski, 1996; Schuele et al., 2007; and Schaefer et al., 2009). For instance, children can be initially taught to identify and segment words into syllables (e.g. "monkey"="mon"…"key") and followed by identification and segmentation of onset-rhyme (e.g. "cat"=/k/…"at"). Research has shown that the level of phonological awareness skills can vary dramatically in young children of the same-age level (Schuele et al., 2007). Adams (1990) has argued that a child's phonological awareness development requires formal explicit teaching (or instruction) at home or in school because mere exposure does not enable the acquisition of phonological awareness at the phonemic level (Kirby et al., 2008). Based on their meta-analysis, Bus and van IJzendoorn (1999) conclude that phonological awareness training has improved not only children's phonological awareness skills, but also their reading ability. In other words, the amount and nature of phonological awareness teaching and learning experiences in the earliest years of life can influence a preschool child's proficiency in phonological awareness.

2.3.3 Print Concepts

Print concepts (CP) describe preschool children's knowledge and understanding about broad organizational properties of print, such as print units (e.g. what constitutes letters and words as compared with pictures and numbers etc.) and print conventions (e.g. how print is organized in a book – the direction in which letters are sequenced and words are read etc.) (Tolchinsky-Landsmann, 2003; and Cabell et al., 2007). In the development of her observation instrument "Concepts about Print"; Marie Clay, one of the pioneers in investigating children's emergent literacy development, maintained that young children learn concepts about print gradually and their knowledge about "*the constraints of the printer's code*" (i.e. the rules of a written language code) is important to their literacy development and progress (Clay, 1989: p.269; and Clay, 2013). Children's knowledge of print concepts reflects their growing awareness that print follows a systematic rule, which is different from other visual patterns or pictures (Adams, 1990), which in turn, enhance their knowledge about how to handle books appropriately such as holding a book upright, finding a book title, turning pages within a book and reading a book from top to bottom and from left to right etc. (Justice & Ezell, 2001; and Cabell et al., 2007). In other words, "*When a child understands what to attend to, in what order, and a few things about the shapes and positions of letters and words, this opens other doors to literacy learning.*" (Clay, 2013: p.42). Research has shown that, during the preschool period, a sophisticated development in print concepts is the recognition of words as comprising different letters (Justice & Ezell, 2001) and the recognition of words as basic unit of print (i.e. concept of word in print), which is a fundamental understanding that children must acquire in order to progress as readers (Bear et al., 2004). Studies have suggested that children's knowledge of print concepts before school entry is predictive of their future reading achievement (Scarborough, 1998a; and Morris et al., 2003).

2.3.4 Emergent Writing

Emergent writing (EW) is generally defined as preschool children's creation and expression of language using print in the forms of meaningful scribbles and marks (Cabell et al., 2007). Between 2 to 3 years old, children initially draw to "print" and gradually they begin to resemble features of writing with smaller combinations of shapes in a linear sequence separated by spaces (Levin & Bus, 2003). Between 3 to 6 years old, children regard shapes and pictures as non-readable (Levy et al., 2006) and identify words as having strings of letters as opposed to single letters (Landsmann & Karmiloff-Smith, 1992). They scribble by using letter-like forms and write random letters (Bear et al., 2004). When a preschool child scribbles next to a self-portrait and identifies the scribble as his/her name, he/she is distinguishing print from drawing. When the child scribbles from left to right, he/she is exhibiting directionality of print concepts (Cabell et al., 2007). Research studies have suggested that children who lack foundational abilities and understandings in alphabet knowledge, print concepts and emergent writing tend to be at an increased risk for developing reading difficulties in formal schooling (Snow et al., 1998). The three measures of alphabet knowledge, print concepts and emergent writing have been consistently shown in the literature to provide useful and positive predictors of children's later literacy success (Scarborough, 1998a; Badian, 2000; Hammill, 2004; and National Early Literacy Panel, 2004). Therefore, they have been considered as very useful measures in identifying young children who may be at risk for later problems in literacy acquisition and development (Cabell et al., 2007).

The most important implication of emergent literacy perspective is that it emphasizes the importance of children's earliest exposure and experiences to literacy at home in the development of their literacy skills well before their formal schooling (Teale & Sulzby 1986; Whitehurst & Lonigan, 1998 and 2001; and Lindfors 2008). Children can gain increasing knowledge and competence of literacy skills through early exposure to literacy-rich environments at home and therefore, it is of the utmost important that future research should focus on the study of children's home literacy environment and experiences because they relate and contribute to the understanding about the development of children's emergent literacy.

2.4. Home Literacy Environment

The home is the earliest learning environment in which children first encounter languages and literacy (Strickland 1990; Sim & Berthelsen, 2014). As such, it naturally attracts the attentions of literacy researchers over the years. Home literacy environment is generally defined as an environment that a family provides to support and foster a child's literacy development at home (Snow et al., 1998; and Zucker & Grant, 2007). This implies that it can vary dramatically among preschool children's families (Adams, 1990; Whitehurst et al., 1994; and Purcell-Gates, 1996). For instances, notable variability can exist in the opportunities for extended family conversations, engaging in storybook reading, and occasional use of print in authentic home tasks such as writing an invitation card to invite friends to a birthday party etc. (Zucker & Grant, 2007). In the home literacy research literature, it has been well-established that children's emergent literacy development is influenced by the presence of literacy support in the home environment and the extent of literacy as part of the family activities (Teale & Sulzby, 1986; Strickland, 1990; Crain-Thoreson & Dale, 1992; Scarborough & Dobrich, 1994; Bus et al., 1995; Senechal et al., 1998; Whitehurst & Lonigan, 1998; Purcell-Gates, 1996 and 2000; Dickinson & Tabors, 2001; Senechal & LeFevre, 2002; Haney & Hill, 2004; Zucker & Grant, 2007; Morrison, 2009; and Rodriguez et al., 2009). Home literacy research has been potentially very important and valuable because it can help educators to identify children at risk of literacy difficulties for early intervention programmes by assessing their home literacy environment (Snow et al., 1998; and Burchinal et al., 2002) and understand how the different facets of home literacy environment influence children's language and literacy achievements (Leseman & de Jong, 1998; Evans et al., 2000; Pan et al., 2005; and Zucker & Grant, 2007).

Home literacy environment comprises different facets of home environment (Leseman & de Jong, 1998; Whitehurst & Lonigan, 1998; Roberts et al., 2005; Zucker & Grant, 2007; and Rodriguez et al., 2009). There are three broad categories of literacy experiences that can be used for describing the home literacy environment: (1) experiences in which children *explore* print on their own at home (e.g. holding storybooks and turning pages); (2) experiences in which children *observe* their parents (or adults) modeling literacy behaviors at home (e.g. reading books or magazines); and (3) experiences in which children *interact* with their parents (or adults) in reading and writing situations at home

(Teale & Sulby 1986; Senechal et al., 1998; Senechal & LeFevre, 2001 and 2002; and Senechal, 2006). The former two categories of children's literacy experiences generally reflect the amount and variety of *literacy resources* available in the home environment for preschool children to explore and observe freely and independently by themselves. The last category of children's literacy experiences reflects the extent and variety of *literacy interactions* presence between parents and children at home. In other words, home literacy environment comprises two main foci of home environment, to which they have been commonly referred in the research literature by global terms as "*home literacy resource*" and "*parent-child literacy interaction*".

2.4.1 Home Literacy Resource

The home literacy resource (HLR) is generally defined as "*the variety of resources and opportunities provided to children as well as parental skills, abilities, dispositions, and resources that determine the provision of these opportunities for children*" (Burgess, 2005: p.250). It has been widely recognized that families can support children's emergent literacy development by simply providing literacy resources such as picture storybooks and writing instruments in the home environment (Snow et al., 1998; and Zucker & Grant, 2007). Home literacy research has established that there is a relation between home literacy resource and children's emergent literacy development (Jordan et al., 2000; Storch & Whitehurst, 2001; Boudreau, 2005; Roberts et al., 2005 and Rodriguez et al., 2009). The number of picture storybooks at home is positively linked to children's early language skills (Payne et al., 1994). Early readers are significantly more likely than nonreaders to have parents who read magazines and newspapers at home (Boudreau, 2005). Early exposure to toys and games that facilitate symbolic play (e.g. toy cooking set) and development of children's fine motor skills (e.g. stacking blocks) has been shown to correlate with preschool children's receptive language skills (Tomopoulos et al., 2006). In the long run, the home literacy resource (e.g. cognitively stimulating toys and learning materials etc.) has been found to modestly correlate with children's intrinsic motivation and positive approaches to learning, which in turn, predict children's later language, cognitive and academic skills (Snow et al., 1998; Gottfried et al., 1998; and Roberts et al., 2005).

Presence of print-rich literacy materials (e.g. magnetic refrigerator letters, posters, signs and labels, writing materials, newspapers and picture storybooks etc.) in the home environment can influence children's emergent reading and other early literacy skills because preschool children who have regular access to these literacy-rich resources at home will naturally spend more time in emergent literacy activities before formal schooling (Strickland, 2001). In addition, it makes sense that these access and exposure to literacy-rich resources in home literacy environment (incl. parents' literacy activities) provide more literacy opportunities and experiences for preschool children to explore independently the literacy materials on their own and freely observe their parents' (or adults') literacy activities at home (Wachs & Gruen, 1982; and Gottfried, 1990), which in turn, support their early literacy skills development. Cunningham and Stanovich (1990 and 1998) suggest that differential exposure and access to print can have long-term consequences because children who have less exposure to print are initially less likely to become skilled readers, resulting in less motivation to read more, which produces a downward spiral where the children with limited exposure to print gain less and less proficiency than their more advanced peers.

2.4.2 Parent-Child Literacy Interaction

Many scholars (and even politicians) have been suggesting that parents are the first and arguably the most important teachers in a child's life (Britto et al., 2006b) because of the plethora of natural learning experiences the parents can foster through parent-child interactions (Bronfenbrenner, 1986; Zucker & Grant, 2007; and Baker, 2014a). Home literacy researchers have long been focusing on investigation of the influences of parent-child literacy interaction (PCLI) on children's emergent literacy development in the home environment. It has been a major focus of investigation in home literacy research because many researchers (incl. both educators and parents) espouse a Vygotskian view that "*What a child can do with assistance today she will be able to do by herself tomorrow*" (Vygotsky, 1978: p.87). Vygotsky's socio-cultural theory of child development provides a useful theoretical framework for home literacy researchers to explore the processes in which families pass along the value, knowledge and skills of literacy through social interactions (Haney & Hill, 2004). The Vygotskyian concept of zone of proximal development (ZPD) (i.e. the point at which a child can master a task only with assistance) asserts that a child's parents is often most familiar with the child's current knowledge and skills. Thus, parents can effectively support their child's learning in the way that corresponds to the child's ZPD, which ultimately provide the child with optimal learning experiences. In other words, a parent can play an important role and has a unique opportunity in gauging a child's ZPD and providing the necessary support and responses to facilitate the child's emergent literacy development through their literacy interactions at home (Au, 1998; Tracey & Young, 2002; and Haney & Hill, 2004).

However, home literacy research has shown that not all children have equal amount (or levels) of experience and interaction with their parents in literacy and print at home (Purcell-Gates, 2000; and Zucker & Grant, 2007). Assessment of parent-child literacy interaction at home will surely provide researchers and educators with more useful information about preschool children's prior literacy experiences before formal schooling. Senechal and colleagues (Senechal et al., 1998; Senechal & LeFevre, 2002 and 2014; Senechal, 2006; and Martini & Senechal, 2012) are among the first of those home literacy researchers to argue that parent-child literacy interaction is comprised of two components: *informal* parent-child literacy interaction and *formal* parent-child literacy interaction.

2.4.3 Informal Parent-Child Literacy Interaction

Informal parent-child literacy interaction (IPCLI) is defined as the literacy interaction between a parent and his/her child where the primary goal is the *message* contained in the print, not the print *per se* (Shapiro et al., 1997; Senechal et al., 1998; Evans et al., 2000; Senechal & LeFevre, 2002 and 2014; Evans & Saint-Aubin, 2005; Senechal, 2006; and Evans & Shaw, 2008). For example, when a parent reads a bedtime story to his/her child, both parent and child focus their attention on the story and illustrations in the storybook (Baker et al., 1998). They share the questions and meanings of the story (Senechal et al., 1995). In other words, the child experiences the literacy interaction with his/her parent around the story in the storybook and this literacy interaction is informal. The influence of IPCLI on children's early development and acquisition of language and literacy skills has been well-documented (Scarborough & Dobrich, 1994; Bus et al., 1995; Senechal et al., 1996; Senechal et al., 1998; Senechal & LeFevre, 2001; 2002 and 2014;

and Senechal, 2006). In particular, the parent-child shared storybook reading has been attracting most home literacy researchers' attention over the years in examining its contributions to the development and acquisition of preschool children's language abilities and literacy skills (Scarborough & Dobrich, 1994; Bus et al., 1995; Neuman, 1996; Leseman & de Jong, 1998; Justice & Ezell, 2000; Sutton et al., 2007; Zucker & Grant, 2007; National Early Literacy Panel, 2008; Senechal & LeFevre, 2002 and 2014; and Edwards, 2014). It is considered as a loving encounter in everyday parent-child shared storybook reading in most literate cultures. Besides, many educationalists have strongly encouraged parents to read to their children as early and as much as possible (Snow et al., 1998; and Armbruster et al., 2003).

Research on parent-child shared storybook reading has revealed its value in promoting children's emergent literacy development through analyzing various aspects of shared storybook reading. Frequency and time spent in parent-child shared storybook reading at home benefit preschool children in many different ways. It has been widely recognized that the more often a child is exposed to reading during the preschool years, the more academically successful that the child will be after he/she begins formal schooling (Sutton et al., 2007). The merit (or value) of frequency in shared storybook reading between a parent and his/her child has been the focus of most literacy research because prior research has found that preschool children, who are more frequently and regularly exposed to shared storybook reading at home, are more likely to use complex sentences; have increased literal and inferential comprehension skills; gain greater story concept and print knowledge development; acquire increased letter and symbol recognition; and develop positive attitudes about reading (Silvern, 1985; Wells, 1985; Crain-Thoreson & Dale, 1992; Mason et al., 1992; Bus & van Ijzendoom, 1992; and Sutton et al., 2007). However, it has been argued that frequency and regularity of reading to children alone are not sufficient to capture many aspects of the rich context of parent-child shared storybook reading that can help preschool children achieve the most benefits (Sutton et al., 2007). Home literacy researchers do agree that parent-child shared storybook reading naturally provides children with vicarious experiences and opportunities of exposure to new words and print and hence reinforces the fundamental concepts about language and print. However, what are the specific features of this informal parent-child literacy interaction that can facilitate the growth and development of children's emergent literacy?

Children's individual characteristics such as children's interest and motivation for reading have been recognized as necessary prerequisites to the prospective rewards gained in language and literacy skills through parent-child shared storybook reading (Sutton et al., 2007). Children with more positive attitudes toward reading tend to read more (Greaney & Hegarty, 1987). Children with higher motivation for reading appear to have better reading skills (Fritjers et al., 2000). Children with heightened interest and active participation during shared storybook reading can learn more language skills than those who are passively engaged with less interest in reading (Beals & DeTemple, 1992; and Senechal et al., 1995). A child's interest and engagement with his/her parents during shared storybook reading have often been portrayed in terms of the child's verbal and nonverbal participation, facial expression and sustained attention etc. (Fritjers et al., 2000; and Sutton et al., 2007).

On the other hand, some observational studies and intervention programmes have suggested other features that emphasize parents' reading behaviors (or skills) and strategies, which can be used to encourage children's active participation during shared storybook reading and hence support the development of children's foundational language and literacy skills. These features include: variability in the quantity of *parents' extra-textual utterances* (e.g. conversations, questions, inferences, types of parent-child talk etc.) that are closely tied to the text (DeTemple, 2001; and Hammett et al., 2003); *interactive reading strategies* (e.g. dialogic reading techniques developed by Whitehurst et al. in 1988) that parents are taught to prompt the child with questions (e.g. using completion prompts, recall prompts and open-ended prompts etc.) to expand the child's verbalizations and rephrase (or extend) the child's utterances until the child can eventually tell the story with minimal assistance (Arnold & Whitehurst, 1994; Whitehurst et al., 1994; and Zevenbergen & Whitehurst, 2003); *distancing strategies* (e.g. describing, demonstrating, sequencing, reasoning, cause-effect inferences, generalizations, planning, suggesting alternatives and drawing conclusions etc.) that parents are encouraged to use de-contextualized discourse[8] in shared storybook reading with the child (Curenton & Justice, 2004) and hence impose a cognitive demand on the child to separate him/her mentally from what is happening in the book during shared storybook reading (Sigel, 1982; and Sigel et al., 1991); and *text structure* (e.g. predictable texts and

[8] De-contextualized discourse refers to the parent-child talk that is outside the immediate context of the print, where the talk can be about objects and events in the past and future (Cureton & Justice, 2004).

narrative texts) that can elicit variable and valuable parent-child conversations related to the meaning of the story during shared storybook reading (Neuman, 1996).

While the informal parent-child literacy interaction has been found to be a significant predictor of children's emergent reading skills, the home literacy research has also suggested that formal parent-child literacy interaction is an important contributor to the children's emergent literacy development (Senechal et al., 1998; Senechal & LeFevre, 2002 and 2014; Haney & Hill, 2004; and Senechal, 2006).

2.4.4 Formal Parent-Child Literacy Interaction

Formal parent-child literacy interaction (FPCLI) is defined as the literacy interaction where a parent directly *teaches* his/her child to read and print words and hence both parent and child focus their attentions on the *written language* (i.e. the print *per se*) (Senechal et al., 1998; Haney & Hill, 2004; Senechal, 2006; Senechal & Young, 2008; Senechal & LeFevre, 2002 and 2014). For instance, when a parent reads an alphabet book to his/her child, the parent focuses the child's attention on the print in the alphabet book and directly teaches the child about letters, words, or name and sound of specific letters (Smolkin & Yalden, 1992). Direct parent-teaching of letter sounds influences children's phonological awareness, letter name and sound knowledge (Storch & Whitehurst, 2001), and written language skills (Senechal et al., 1998). In an empirical study, Evans et al., (2000) found that direct parent-teaching activities such as teaching letter names and sounds and printing letters contribute to children's print-related literacy skills. Direct parent-teaching of early phonological awareness skills such as rhyme and alliteration during shared storybook reading accelerates children's rhyme awareness (Justice et al., 2005). Based on the analysis of maternal teaching patterns during shared storybook reading and a puzzle task, Britto and colleagues (2006a) suggested that direct parent-teaching of literacy skills positively contributes to the development of children's expressive language skills. In an intervention training programme, Justice and Ezell (2000) introduced parents to use *print-referencing* technique, which requires parents to use verbal and nonverbal cues to direct the child's attention to focus on print through questioning, commenting, requesting about print and pointing to (or tracking) the print. The results show significant gains (for the preschool children in the experimental group) in several emergent literacy outcomes such as ability to identify words in print, segment word phrases and aware print concepts. When parents directly teach their children letter names and sounds at home, the children may know more letters and demonstrate higher invented spelling scores than their peers (Ehri & Roberts, 2006), which in turn, are significantly contributing to their later reading achievements (Adams, 1990; and Scarborough, 2001). In other words, the formal parent-child literacy interaction can accelerate the development of early literacy skills in preschools children. In the long run, direct parent-teaching continues to influence children's later reading fluency in the elementary school (Senechal, 2006).

Parents can support and foster their preschool children's literacy development at home by providing a variety of formal parent-child literacy interaction opportunities such as direct parent-teaching of letters and sounds, and parent-scaffold writing of letters and words (Zucker & Grant, 2007). The home is considered as an opportune location for young children to practice invented spelling and hence simultaneously develop their phonemic awareness through functional or purposeful writing[9] experiences directed by parents (Richgels, 2001). In an observational study that examined the characteristics of mother-child joint writing sessions, Aram and Levin (2002) showed that the level of maternal-scaffold writing was strongly related to children's basic literacy skills such as word writing and recognition outcomes as well as phonological awareness scores. Home literacy research has suggested that the context of shared storybook reading provides excellent opportunities for parents to simultaneously teach their preschool children directly the language skills because it provides a genuine framework for rich conversations (Crain-Thoreson & Dale, 1992), for learning de-contextualized language[10] and new vocabulary (Dickinson & Snow, 1987; Westby, 1991; and Curenton & Justice, 2004). During shared storybook reading, a parent can directly teach his/her child naturally and explicitly the print concepts (incl. print functions and conventions such as directionality of print in text from left-to-right and top-to-bottom etc.), alphabet knowledge, words, letters and text orientations (Justice & Ezell, 2002 and 2004; and Sutton et al., 2007). Therefore, it is evident that the two components of parent-child literacy interaction

[9] Writing is considered as a more difficult concept for preschool children to grasp than oral speech because it requires an additional step of producing inner speech, and then translating it into writing (Vygotsky, 1962).

[10] De-contextualized language is the language that refers to the context outside of the immediate situation in the print.

are necessary for preschool children to acquire early literacy skills. Besides, it has been suggested that generally the informal should precede the formal (Phillips et al., 2008).

On the other hand, it has been argued that parents, who regularly engage their preschool children in shared storybook reading, do not necessarily teach their children directly the specific literacy skills (Teale, 1986; Senechal et al., 1998; and Senechal & LeFevre, 2001). Some empirical studies have shown that the two components of parent-child literacy interaction are independent of each other (Fitzgerald et al., 1991; Stipek et al., 1992; Evans et al., 2000; Sonnenschein et al., 1996; Senechal et al., 1998; Aram & Levin, 2002; Senechal & LeFevre, 2002; and Senechal, 2006). Furthermore, some research studies have shown that both the informal and formal parent-child literacy interactions appear to influence different components of children's emergent literacy development (Senechal et al., 1998; Evans et al., 2000; Storch & Whitehurst, 2001; Senechal et al., 2001; LeFevre & Senechal, 2002; Haney & Hill, 2004; Senechal, 2006; Zucker & Grant, 2007; Hood et al., 2008; Phillips et al., 2008; and Martini & Senechal, 2012).

2.4.5 Quality of Parent-Child Literacy Interaction

Although the benefits of both the informal and formal parent-child literacy interactions are numerous and well-documented (Whitehurst et al., 1988; Senechal, et al., 1995; Senechal et al., 1998; and Senechal, 2006), their effect size and amount of explained variance accounting for the development of children's emergent literacy have been found modest with mixed results in children's literacy research literature (Scarborough & Dobrich, 1994; Bus et al., 1995; Senechal, et al., 1998; Bracken & Fischel, 2008; Hood et al., 2008; and Stephenson et al., 2008). As a result, their importance and extent of effects have been long debated since the mid-1990s (Scarborough & Dobrich 1994; Bus et al., 1995; Evans et al., 2000; van Kleeck et al., 2003; Sutton et al., 2007; Aram 2008; and Phillips et al., 2008).

A meta-analysis conducted by Scarborough and Dobrich (1994), based on more than three decades of 31 empirical studies identified, revealed that the parent-child shared storybook reading accounted for no more than 8% of the variance in children's early or subsequent literacy development and was considered as "*unexpectedly modest*" (p. 245). Another meta-analysis conducted by Bus et al., (1995) also reported that time spent in the parent-child shared storybook reading at home carried a modest predictive value, accounting for only approximately 8% of the variance in children's future literacy skills. Some other researchers (e.g. Fritjers et al., 2000; and Burgess et al., 2002) have also reported less promising findings for the parent-child shared storybook reading at home, accounting for only 3.2% to 13.0% of the variance in children's later literacy skills. Some studies (e.g. Baker et al., 1998; Evans et al., 2000; Senechal & LeFevre, 2002; and Foy & Mann, 2003) have found no significant relationship between the parent-child shared storybook reading and children's later literacy skills. Evans et al., (2000) used a checklist of children's book title recognition as a proxy for frequency of home shared storybook reading and found no contribution of home shared storybook reading to the prediction of children's print and language skills in kindergarten after controlling for age, parent education, and cognitive ability. Although they found that parents' report of home literacy activities involving letters name and sounds was a significant predictor of children's vocabulary print-related and phonological skills in kindergarten, they reported that letter name, letter sounds, phonological sensitivity, and receptive vocabulary are not improved through common parent-child shared storybook reading. In a recent 3-year longitudinal study conducted with an Australian sample of 143 children from preschool to Grade-2, Hood et al., (2008) reported that the parent-child literacy interaction at home accounted for only about 4.6% and 5.6% of the variances in children's preschool literacy skills and Grade-1 literacy skills respectively after controlling for age, gender, memory and nonverbal ability. Why this is the case?

These inconsistent accounts might reflect the fact that certain technical problems, which involve measurement issue (e.g. validity and reliability) and methodological issue (e.g. choice of an appropriate statistical analysis strategy), should be addressed in future research because they affect the estimation of structural parameters and hence attenuate the effect size of one variable on another in all empirical studies (Please see Chapter 3 for further detailed discussion). With respect to the amount of explained variance, one plausible and critical reason is probably related to the structural issue, which is a theoretical problem (or specification problem). In other words, other relevant variables might have been improperly ignored in the theoretical models asserted in the research literature and hence it has led to the consequences at the statistical level.

In recent years, a relatively new notion of *quality* with respect to the parent-child literacy interaction has received increasing attention in the field of children's early literacy research (Sutton et al., 2007). It is clear that learning to read and write does not happen naturally in young children without parents' support and guidance (National Center for Learning Disabilities, 2010). Besides, Sutton and colleagues (2007) argued that young children do not learn to read simply by listening to someone else reading to them. It has already been argued that a child's successful development and acquisition of early language and literacy skills require more than the parent simply "read" and the child passively "listen" (Teale & Sulzby, 1987; Beals et al., 1994; Reese, 1995; and Phillips et al., 2008). As discussed earlier, a parent can play an important role in gauging his/her child's ZPD and hence provide necessary support and responses to facilitate and enhance his/her child's emergent literacy development during their literacy interactions (Au, 1998; Tracey & Young, 2002; and Haney & Hill, 2004). Based on previous research evidence, it has been suggested that a supportive and responsive home literacy environment is critical for the development and acquisition of children's early language and literacy skills (Landry & Smith, 2006; Zucker & Grant, 2007; and Lindfors, 2008). Therefore, the quality of parent-child literacy interaction has been generally used in literature to describe the degree and extent of parents' supportiveness/responsiveness for their children's early language and literacy development in home literacy environment. A high quality parent-child literacy interaction has often been characterized as supportive and responsive interaction style initiated by sensitive parents (Girolametto & Weitzman, 2002), together with enjoyable and active participation style responded from young children (Sutton et al., 2007) with back-and-forth lively conversations, a *give-and-take* phenomenon, in the home literacy environment.

However, research studies have shown that parents, who engage their preschool children in shared storybook reading, read to their children in a wide variety of ways in the home literacy environment ranging from reading text verbatim to interactive approach (Neuman, 1996; Senechal et al., 1998; and Phillips et al., 2008). Given that the notion of quality with respect to the parent-child literacy interaction is fairly new (Purcell-Gates, 2000; Zucker & Grant, 2007; and Sutton et al., 2007), most home literacy research on parent-child shared storybook reading has focused on frequency rather than quality of literacy interaction at home (Senechal et al., 1998; and Sutton et al., 2007).

Some research studies have suggested the importance of emotional quality during parent-child literacy interaction in the development of children's early language and literacy (Baker et al., 1998; de Jong & Leseman, 2001; and Serpell et al., 2005). In the case of bilingual families, for example, Tabors and Snow (2001) suggested that the quality of parent-child literacy interaction is particularly important in ensuring that children's first language is used to develop a firm foundation for learning to speak and read a second language. Despite these research efforts, a knowledge gap still exists regarding how the quality of parent-child literacy interaction is related to children's early literacy outcomes and how parents can enhance the optimal quality of literacy interaction with their preschool children around books and hence promote their early literacy acquisition and development (Hood et al., 2008).

Some researchers suggest that parents' knowledge and skills are important in creating a high quality parent-child shared book reading. As such, they can be trained to enhance the quality of parent-child interaction in home literacy activities (Neuman & Gallagher, 1994; Whitehurst et al., 1994; and Sutton et al., 2007). Various parent training intervention studies have demonstrated certain positive effects of improved parents' knowledge and skills for engaging their children in shared storybook reading and hence contributed to the development of children's early language skills. However, not all the parents have been benefited from these training programmes. For instance, in an intervention parent-teacher training programme conducted in the United States, Whitehurst et al., (1994) found that the frequency of parents reading to their preschool children at home varied substantially with the mean reading frequency ranging from 8 to 53 times during the course of 6-week intervention. Since all these parents in the intervention programme were trained on the importance of reading to their preschool children and how to engage their children with interactive reading approach in order to reap the most benefit from their shared storybook reading, why did the parents read to their children so infrequently at home?

One might argue that parent-child shared storybook reading is an interactive and socially constructed activity created by both parent and his/her child (Sulzby & Teale, 1991). This interactive social-construction view suggests that a child's ability and active participation in the shared storybook reading process are also important in creating a high quality of parent-child literacy interaction around books. However, as Maccoby and Martin (1983) rightly pointed out that *parent-child relationship* is unique among all human relationships, particularly in its initial (e.g. during the earliest years of life) asymmetry in terms of the enormous differential in power and competence (e.g. cognitive abilities, language abilities, knowledge and skills etc.) that exists between a parent and his/her child. This inevitably implies that in many respects, a parent is much more influential than his/her child in all parent-child interactions during the preschool years. Therefore, it is of paramount importance for a parent to be sensitive enough in making shared storybook reading enjoyable and comprehensible for his/her child by supporting appropriately and responding consistently to his/her child's needs and characteristics (Bus, 2001; and Wasik & Bond, 2001). Ultimately, this is in line with the concept that originates from the socio-cultural framework (Bruner, 1972; and Vygotsky, 1978), which describes how children's social and cognitive developments occur in a social context through interaction with supportive, responsive and competent others. As such, effective parental supportiveness and responsiveness for children's immature skills can help them to achieve higher levels of learning and self-regulation (Lindfors, 2008; and Morrison, 2009), which correspond to the concept of ZPD as discussed earlier.

As Bingham (2002) suggested, perhaps, teaching parents about the knowledge and skills of shared storybook reading with their children may have ignored the quality of relationship that exists between the parents and their children, which may enhance or impede the nature and quality of parent-child literacy interaction at home. Indeed, the research literature has already suggested the importance of the quality of parent-child relationship for the development of children's early language and literacy (Vygotsky, 1978; Bowlby, 1988; Bus et al., 1995; Bus & van Ijendoorn, 1988 and 1997; and Baker et al., 2012). Since parent-child literacy interaction is only a part of the whole series of interactions (or history of interactions) between a parent and his/her child in daily life that constitute their underlying parent-child relationship, it makes sense to assert that the quality of parent-child relationship should form the basis for creating high quality interactions in all home literacy activities between the parent and his/her child. High quality interactions that permeate in all aspects of home literacy environment demand the attributes of parents such as parental love, care and sensitivity for supporting appropriately and responding consistently to their children's moment-to-moment needs and characteristics (e.g. biological, social and emotional etc.) when parenting, which in turn, is embedded in a trustworthy relationship that exists between a parent and his/her child (Hinde, 1979; and Bus & van Ijzendoorn, 1988).

Future home literacy research (incl. children's literacy intervention studies) should be geared towards examining how the quality of parent-child relationship may influence the different facets of home literacy environment, especially the occurrence of parent-child literacy interaction, and hence contribute to the development of children's emergent literacy.

2.5. Parent-Child Relationship

Blake (1954) postulated the idea that an understanding of parent-child relationship is fundamental and vital in nurturing children and families because it contributes towards not only understanding the challenges in dealing with child's health problems of both physical and mental, but also supporting the child's developmental tasks that help the child become competent in all aspects of child functioning. Over the last half century, this idea has been garnering the support from the voluminous research literatures and empirical studies from multiple disciplines in human development, child psychology, family science, developmental science, social science and nursing science etc. For instances, the field of nursing science has been emphasizing parent-child relationship as the context for parenting and supporting children's health and development (Lutz et al., 2009). Besides, the fields of social science and developmental science have been focusing on the importance of parent-child relationship and its influences on child developmental outcomes across cultures and social strata (Bornstein & Cheah, 2006). Overall, it is widely accepted that a child's competencies in all aspects of child functioning, in particular the developmental functioning, are rooted in the parent-child relationship (Lutz et al., 2009).

From the emergent literacy perspective, it encompasses this idea that, in the context of promoting the development and acquisition of early children's language and literacy skills, the parent-child relationship plays an important role and it's influences on the development of children's emergent literacy must be understood and taken into account, and hence as a focus for further assessment and developmental support.

2.5.1 Parent-Child Interaction

In the research literature concerning the influences of parent-child relationship on children's developmental outcomes, particularly on their early literacy skills and later school success, most investigations have focused primarily on behavioral interactions between parents and children in their home literacy activities (e.g. during their shared storybook reading) by using observational methods (e.g. Hess et al., 1984; Estrada et al., 1987; Bradley 1989; Brody et al., 1994; Barnard & Martell, 1995; and Parke & Buriel, 2006). Among all these studies, various *evaluative labels* (e.g. maternal responsiveness (or sensitivity), parental control (or restrictiveness), and warmth etc.) have been used to assess the quality of parent-child interaction and hence the parent-child relationship. Such evaluative labels appear important by themselves because parents see the relationship with their children in such terms. As such, they affect parents' views of the relationship with their children and hence their future actions. Although these studies did produce certain statistically significant results (*if any*) based on the use of traditional regression analyses for the empirical data, it often accounted for only a small proportion of the variance. Nevertheless, at least, such empirical findings appear to suggest that children's early relationship with their parents is, to a certain extent, important for their early language and literacy development (Bowlby, 1988; and Bus & van Ijzendoorn, 1997).

2.5.2 Parent-Child Attachment

From the research studies of parent-child interactions during the early preschool years, some research has focused on assessing parent-child attachment styles using Ainsworth's Strange Situation procedures (Ainsworth et al., 1978) that are based on Bowlby's Attachment Theory (Bowlby, 1984 and 1988) by observing the behaviors of parent-child dyads in research laboratory settings through a series of episodes. Research studies on attachment security have shown that children's feelings of trust to their parents are related to their exploratory behavior and hence contribute to the differences in adequacy of parental instructive interactions (Bus & van Ijzendoorn, 1995). The term "secure base" is used to describe the role of attachment figures (e.g. parents) in stimulating children's exploration of the environment (Ainsworth et al., 1978). Generally, attachment studies categorize young children into three different groups: "Securely-attached"; "Insecure-resistant"; and "Insecure-avoidant" children based on their behaviors in the strange situations. These categories are perhaps suitable for describing categories of parent-child relationships (Hinde, 1979) during the preschool period. Research on the relations between parent-child attachment styles and home literacy activities may have highlighted the importance of parent-child relationship quality on the development of children's emergent literacy.

Bus and van Ijzendoorn (1988) studied a group of mother-child dyads and examined the relations between preschoolers' attachment styles and their literacy interactions with parents. They found that the securely-attached children experienced better quality literacy interaction with their parents during shared storybook reading. In another attachment study with three groups of 3-year-olds children, Bus and van Ijzendoorn (1995) found that children's attachment styles is significantly related to the frequency of reading, where the mothers of securely-attached children read more frequently to their children at home. They also found that in the infrequently reading parent-child dyads, there were more irrelevant interactions occurred (e.g. maternal disciplining). Besides, research has shown that mothers of the securely-attached children are not only more responsive, but also more efficient at contingently supporting (or scaffolding) their children during their literacy interactions (Bus et al., 1997). On the other hand, the insecure-avoidant dyads were found to have relatively higher mean scores on reading of the text verbatim with more distractions from the children (Bus et al., 1997). Therefore, these research findings from the parent-child attachment studies with preschool children appear to support the assertion that the quality of parent-child relationship influences both frequency and quality of parent-child literacy interaction and hence contributes to the development of children's emergent literacy.

2.5.3 Parent-Child Relationship Quality

Practically, there are two constraints in the studies of effects of parent-child relationship quality on home literacy activities. First, in most children's literacy research (incl. those related parent-child attachment studies), the standard technique of using behavioral interactions between parents and children as a proxy for parent-child relationship quality is not applicable to the study of relationship because behavioral interactions and relationship exist at different levels of *social complexity* and thus a relationship has properties that are not present in the behavioral interactions themselves (Hinde, 1979 and 1995). Therefore, it is argued that one cannot proceed from the generalizations about behavioral interactions across parent-child dyads to the generalizations about parent-child relationship (for a review, see Hinde, 1995; and Hinde & Stevenson-Hinde, 1987). Second, given the importance of observing how parents and children interact with one another during their literacy interactions, observational method has been valuable for studying these processes. However, it should be noted that observational method tends to neglect the *subjective aspects* of parent-child relationship in the participants involved and therefore it provides data inevitably limited in time and space (Hinde, 1995). In the assessment of behavioral interactions between a parent and his/her child using observational method, it challenges the observer (investigator) to accurately record and correctly interpret the experiences (meanings) that the behavioral interactions have for that particular parent-child dyad, in that particular situation in place (Hinde & Stevenson-Hinde, 1987). Furthermore, these observational studies are often conducted in research laboratory settings with a book unfamiliar to both parent and child, some variability in quality of parent-child literacy interaction due to naturalistic settings in the home environment (particularly with familiar books at home), rather than issues of security, may have been lost. Yet, even with the use of home settings in observational studies, it is possible that parents may alter their typical behaviors (or literacy interactions with children) in order to adhere more closely to their notions of the most socially acceptable way of interacting with young children in shared storybook reading because they are being observed (Scarborough & Dobrich, 1994; and Zcker & Grant, 2007).

Despite all these constraints, the decades' promise that parent-child relationship is vital and fundamental in nurturing a child and hence promote his/her competencies in all aspects developmental functioning including the child's early language and literacy development should not be shaken. Perhaps, a more comprehensive approach towards relationship that focuses the analysis primarily on parent-child relationship at relationship level, rather than at the behavioral interaction level and/or individual characteristics, may offer a way forward though it does present challenges involving incredible complexity in the study of human relationships including the parent-child relationship.

In the study of the science of human relationships, as defined by Hinde (1979 and 1995), Hinde and Stevenson-Hinde (1987), a relationship between two individuals (e.g. parent-child relationship) involves series of interactions over time, where the child should be treated "*not as an isolated entity but as a social being, formed by and forming part of a network of relationships which are crucial to its integrity.*" (Hinde & Stevenson-Hinde, 1987: p.1–2). Each relationship must be seen as "*a dynamic flux*" involving properties that are not present in its constituent interactions where each interaction may be affected by preceding ones and by expectations about the future (Hinde, 1995). While the nature of component interactions depends on the characteristics of individuals involved, they may affect the nature of relationship that in return affects the nature of its component interactions, which means that the relationship and its component interactions are interdependent.

From the perspective of each individual in the relationship, it involves his/her subjective experiences of the relationship (e.g. feelings, attributions, conflict, desires, hopes, and disappointments etc.) that affect his/her own behaviors, which in return, affect his/her subjective experiences of the relationship (Hinde, 1995). This means that an individual's behaviors and his/her subjective experiences of the relationship are also interdependent. Furthermore, each relationship exists in "*a social context*" and is influenced by the socio-cultural structure (i.e. the system of values, norms, stereotypes, myths and institutions etc. of the group), in which it is embedded (Hinde, 1979 and 1995; and Hinde & Stevenson-Hinde, 1987).

The implication of these conceptualizations of relationships is that the study of human relationships involves processes of incredible complexity at a number of different levels (Hinde, 1995) such as individual's *behavioral* level (e.g. smile and supportive behavior), *interaction* level (e.g. reciprocal and complementary interactions) and *relationship* level (e.g. intimacy and commitment). However, as Hinde (1995) suggested, it is possible, in the study of human relationships, to select and use suitable "*markers*" for describing key aspects of relationships that can bypass some of the detailed complexities and hence focus on the relationships themselves.

A parent and his/her young child can relate to one another on many different dimensions of their parent-child relationship (Hinde & Stevenson-Hinde, 1987; Radke-Yarrow et al., 1988; and Hinde, 1995), which exits over time and changes with time as the child grows (Hinde, 1979 and 1995). Therefore, in analyzing parent-child relationship, it is argued that one must choose the level of analysis and identify the key dimension(s) of the relationship (in combination that is appropriate to the case in hand) that can provide a reasonably complete description of the relationship and at the same time are suitable for measurement or assessment (Hinde, 1995). In this present research study, I apply this relationship perspective by Hinde and Stevenson-Hinde and choose relationship level as the level of analysis because it is beneficial to think about parent-child relationship during the preschool years in terms of quality of relationship at relationship level based on the grounds that the ways by which parent-child relationship quality is described may affect its future course of actions (Hinde, 1995).

As a useful first step, I reason that an important element of the meaning of parent-child relationship quality (PCRQ) is reflected in parents' expressed satisfaction on parent-child relationship with their children. Since what the individuals in a relationship think or feel are important and affect each other (Hinde, 1995), I select to focus on the assessment of subjective aspects of parent-child relationship based on primarily parents' perspective because it is technically difficult, if not impossible, to measure the subjective aspects of parent-child relationship from preschoolers' perspective given their lack of maturity and ability to perceive the complexity of parent-child relationship. In order to capture the information of parental satisfaction on parent-child relationship, it should satisfy the criteria for a relationship that it is based on series of interactions over time, across varied situations, with a history and expectations for the future. In the interpretation of the assessment of parental satisfaction as a surrogate measure of parent-child relationship quality, it should be recognized that it is dealing with one aspect of the parent-child relationship at relationship level. However, the dimension of parental satisfaction can be assumed as a central quality of a parent-child relationship at any development level.

2.6. The Theoretical Framework and Research Hypotheses

Based on the review of research literature and the working conceptualization discussed above regarding the quality of parent-child relationship and its interplay with the home literacy environment and the development of children's emergent literacy, a theoretical framework is proposed that suggests a hypothetical mediation structure, which posits an underlying mechanism through which the parent-child relationship quality might affect the development of children's emergent literacy, *not directly*, but rather through an intervening process, captured by the home literacy environment, in particular, the parent-child literacy interaction. More specifically, parent-child relationship quality affects parent-child literacy interaction, which in turn, contributes to development of children's emergent literacy. In other words, the parent-child literacy interaction transmits the effect of parent-child relationship quality to the development of children's emergent literacy with the specified structural relationships: PCRQ→PCLI→EL. Therefore, in order to increase our understanding about the underlying mechanism of the developmental process of children's emergent literacy, the *indirect effect* of parent-child relationship quality on the development of children's emergent literacy must be taken into account.

Theoretically, both parent-child literacy interaction and children's emergent literacy are specified as multidimensional concepts, which contain multiple dimensions and each dimension can be measured by some specific items (indicators). As discussed earlier, different components of parent-child literacy interaction influence differentially different dimensions of children's emergent literacy. However, in most empirical studies, a scale developed to operationalize a home literacy environment construct (or an emergent literacy construct) comprises multiple dimensions with multiple items. Usually, a global composite score is calculated to represent a construct. As a consequence, it overlaps various dimensions of the construct in a single composite index. Examples of composite index for the parent-child literacy interaction construct can be found in various empirical studies (See Whitehurst, 1993; Payne et al., 1994; Griffin & Morrison, 1997; Linver et al., 2004; Umek et al., 2005; and Senechal & LeFevre, 2014). This approach of combining and replacing different dimensions of a construct by a single composite variable has been criticized in the literature in that it cannot provide an accurate reflection of the complex phenomenon of what it is intended to measure (Leseman & de Jong, 1998; Senechal et al., 1998; Roberts et al., 2005; Meisels, 2006; and Zucker & Grant, 2007). In addition, differential effects of different dimensions of a construct might cancel out each other and thereby attenuate the effect size of one variable on another (Aish & Wasserman, 2001). Consequently, researchers lose the information about the potential differential effects of different dimensions of the construct.

Since different components of the parent-child literacy interaction construct might be differentially predictive of different dimensions of the children's emergent literacy, it is important to take their differential effects into account. This implies that the potential of multiple mediation processes through each dimension in the hypothetical mediation structure should be investigated. In other words, the PCRQ construct might affect differentially different dimensions of the PCLI construct (i.e. IPCLI and FPCLI), which in turn, influence differentially different components of the EL construct (i.e. AK; EW; PA; and CP). Therefore, I hereby formulate the following research hypotheses for empirical testing and evaluation. These hypotheses are translated into a theoretical model of PCLI for the development of children's emergent literacy as diagrammed in Figure 2.3 below, which depicts the multiple mediation processes that may underlay the developmental process of children's emergent literacy.

H1: The informal parent-child literacy interaction mediates completely the effect of parent-child relationship quality on alphabet knowledge.

H2: The informal parent-child literacy interaction mediates completely the effect of parent-child relationship quality on emergent writing.

H3: The informal parent-child literacy interaction mediates completely the effect of parent-child relationship quality on phonological awareness.

H4: The informal parent-child literacy interaction mediates completely the effect of parent-child relationship quality on print concepts.

H5: The formal parent-child literacy interaction mediates completely the effect of parent-child relationship quality on alphabet knowledge.

H6: The formal parent-child literacy interaction mediates completely the effect of parent-child relationship quality on emergent writing.

H7: The formal parent-child literacy interaction mediates completely the effect of parent-child relationship quality on phonological awareness.

H8: The formal parent-child literacy interaction mediates completely the effect of parent-child relationship quality on print concepts.

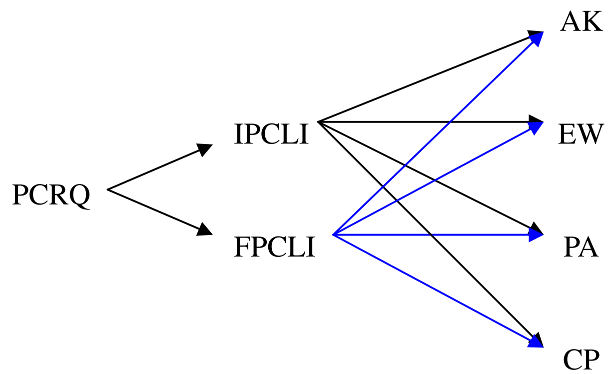

Figure 2.3: A theoretical model of PCLI for the development of children's emergent literacy

In the preceding literature review, it is clear that the proposition of the indirect effect of parent-child relationship quality on children's emergent literacy development focuses mainly on the intervening process through parent-child literacy interaction, rather than home literacy resource. However, it also makes sense to examine the home literacy resource as another key mediating construct in the underlying mechanism for the developmental process of children's emergent literacy because home literacy resource is one of the major foci of the literacy environment created by parents at home. In other words, it can also be postulated that the home literacy resource transmits the effect of parent-child relationship quality to the development of children's emergent literacy with the specified structural relationships: PCRQ→HLR→EL. Thus, I formulate additional research hypotheses as below for empirical testing and evaluation. The respective theoretical model of HLR for the development of children's emergent literacy is depicted in Figure 2.4 below. In essence, a comparison between these two proposed theoretical models can be made in this research study based on empirical evidence.

H9: The home literacy resource mediates completely
the effect of parent-child relationship quality on alphabet knowledge.

H10: The home literacy resource mediates completely
the effect of parent-child relationship quality on emergent writing.

H11: The home literacy resource mediates completely
the effect of parent-child relationship quality on phonological awareness.

H12: The home literacy resource mediates completely
the effect of parent-child relationship quality on print concepts.

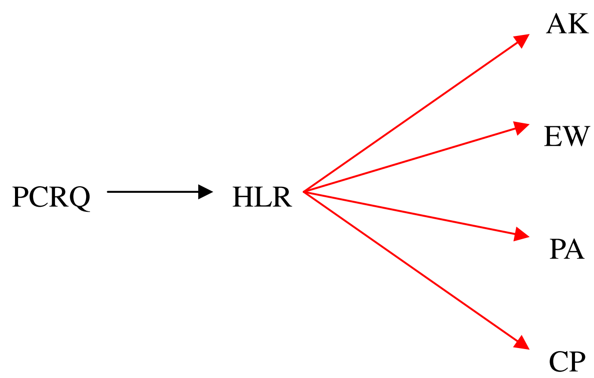

Figure 2.4: A theoretical model of HLR for the development of children's emergent literacy

Since this is a cross-sectional study together with some practical constraints in terms of scale of study, the inherent reciprocal and dynamic relations among the factors cannot be taken into account. For example, the cumulative effects of continuously improving quality of parent-child relationship on the development of children's emergent literacy in two-parent-one-child families cannot be accounted for. However, these two proposed theoretical-conceptual models do address the structural issue concerning the underlying mechanism of the developmental process of children's emergent literacy. It explicitly takes into account the indirect effect of parent-child relationship quality and hence posits the hypothetical mediation structure for the development of children's emergent literacy. In addition, the models address the issue of multidimensionality among the theoretical constructs by disentangling the influences from different dimensions of each construct, while at the same time accounting for the interactions among different dimensions of the theoretical constructs included in the models.

Regarding the sampling and sample characteristics, the measures of the theoretical constructs and questionnaire design, related technical problems that involve both the measurement issue and methodological issue, and the strategy of statistical analysis for testing and evaluation of the hypothesized mediation models are further discussed in Chapter 3 that follows.

Chapter 3: Research Methods

3.1. Sampling

In Hong Kong, early childhood education is provided to preschool children in the age group 3–6 years old through kindergartens[11]. Although it is not a free and compulsory education, almost all preschool children (more than 95%) in the preschool–aged group are enrolled in kindergartens (Rao & Li, 2009; and Li et al., 2010). In 2011–12, there were about 157,400 preschool children enrolled in 946 kindergartens (Education Bureau, 2012). In terms of preschool curriculum[12], Hong Kong kindergartens are divided into two types, namely local and non-local curricula (Education Bureau, 2012). Generally, international kindergartens or kindergartens operating non-local curriculum are adopting English language as the medium of instruction and admission to these kindergartens requires the preschool children having acquired certain level of early English language skills. Families, who are seeking to immerse their preschool children early in these kindergartens in Hong Kong, have to prepare their preschool children to learn English language skills.

In this research study, I focus on investigating the preschool children in Hong Kong who have been learning English alphabetic writing system in their home environment. Therefore, the parent-child paired participants in this empirical study were sampled from the population of families whose preschool children had been admitted and registered in the kindergartens operating non-local curriculum in Hong Kong. I used systematic random sampling to choose the parent-child paired participants in the study population of the kindergartens operating non-local curriculum in Hong Kong. A complete list of 133 registered kindergartens operating non-local curriculum as of April 2011 was retrieved from the Education Bureau (2011) and it was listed in a random order. A total of 33 kindergartens were sampled systematically from the randomly ordered list of 133

[11] All kindergartens in Hong Kong are owned by either private enterprises or non-government organizations. These kindergartens are registered with and supervised by the Education Bureau (EDB). About 80% of the kindergartens are non-profit making (NPM) and the remaining 20% are private independent (PI). While NPM kindergartens receive government subsidy and their net profit must be used for school development, the PI kindergartens do not receive any government subsidy and their owners can pocket the net profit earned (Li et al., 2010).

[12] Kindergarten education is a non-compulsory education prior to formal school entry in Hong Kong and generally, formal instruction in reading and writing begins in Grade 1 in primary schools.

kindergartens. A research letter of invitation (See Appendix A) was sent to each principal of these 33 selected kindergartens to invite them to participate in this research study. A total of 19 kindergartens consented to participate in this study while the remaining 14 selected kindergartens decided not to participate. When I followed up by telephone calls with the principals of non-participating kindergartens, the most common reasons were "heavy workload" and "no interest". From these 19 participating kindergartens, a total of 843 preschool children in the age range from 3-year-9-month (3:9) to 4-year-3-month (4:3) at the time of this research assessment were sampled. Further participation consent was sought from parents of each selected preschool child. Each parent-child paired-participation was voluntary. Confidentiality and anonymity of the information collected were guaranteed.

Data collection was primarily split into two consecutive stages in each participating kindergarten: Early Childhood Literacy Development Questionnaire for parents; followed by GRTR!-Revised literacy test for preschool children. I disseminated a total of 843 standard research packages to parents of the selected preschool children in the 19 kindergartens. Each standard research package consisted of three items: (1) a research letter of participation (See Appendix B) with a Research Participant Consent Form to explain the purpose and procedures of this study; (2) a standard questionnaire (See Appendix C); and (3) a stamped return pre-addressed envelope. On receiving the standard research package, the parents of each selected preschool child were requested to complete the standard questionnaire at home and return the completed standard questionnaire together with the signed Research Participant Consent Form to the researcher directly within 2 weeks using the stamped return pre-addressed envelope provided. The principal of each participating kindergarten was requested to help the researcher send a reminder to all the parents of selected preschool children a week before the deadline specified in the research letter of participation. A total of 471 completed standard questionnaires together with 463 signed participant consent forms were received. Eight preschool children's parents returned their completed standard questionnaires but disagreed for their children to participate in the literacy test. The questionnaire response rate is 56%.

Based on the parents' consent forms received, a total of 463 preschool children could participate in the literacy test. A list of preschool children participating in the literacy test was compiled for each kindergarten. Afterwards, I discussed and arranged with each principal to confirm an appropriate date for the literacy tests to be conducted in the kindergarten. The administration of each literacy test required three items: (1) a literacy test easel; (2) a standardized answer sheet and (3) a pencil. A small table was set up in a quiet place in the kindergarten. The researcher (or an examiner[13]) sat across the corner of a table from the child so that the researcher could see both sides of the easel. Before conducting the GRTR!-Revised test with each child, the researcher interacted with the child and naturally guided him/her into the literacy test that lasted for about 10–15 minutes per child. The researcher followed the standardized administration procedures step-by-step for each literacy test as specified in the GRTR!-Revised instruction manual (National Center for Learning Disabilities (NCLD), 2009) and recorded the information about and the test results of each preschool child on a standardized answer sheet (See Appendix D). After each preschool child thoroughly completed the GRTR!-Revised test, he/she was given stickers or a little gift for participation. A total of 432 preschool children in the sample thoroughly completed the GRTR!-Revised test. The remaining 31 preschool children could not complete the literacy test due to absence or unwilling to complete the literacy test on the test dates. The parent-child paired-participation rate is 51%.

In the sample of 432 parent-child paired-participants, there were 237 boys (55%) and 195 girls (45%) and the ages ranged from 44 to 51 months at the time of the literacy test (M=48 months; *SD*=2). In terms of the ethnicity, there were 270 Chinese (63%), 82 Europeans (19%), 56 other Asians (13%) and 24 others (5%). For the 25-item GRTR!-Revised test, the mean Number Correct score was 16 (*SD*=4.1 and range=2–25). Based on the preschool children's total Number Correct score, the distribution of Step score was: 62 children (14%) achieved Step 4 (Number Correct=21–25); 263 children (61%) achieved Step 3 (Number Correct=14–20); 105 children (24%) achieved Step 2 (Number Correct=5–13) and 2 children (1%) achieved Step 1 (Number Correct=0–4). The distribution of Performance Level was: 192 children (44%) were Above Average; 200 children (46%) were Average and 40 children (10%) were Below Average.

[13] Examiners, who administered the GRTR!-Revised test in this empirical study, had received general training for assessments to preschool children and specific training for administering the GRTR!-Revised test according to the GRTR!-Revised instruction manual (National Center for Learning Disabilities, 2009).

Based on the 432 standard questionnaires received, 344 mothers (80%) and 88 fathers (20%) completed and returned the standard questionnaires and all of them identified themselves as biological parents of their preschool children. Most participating families (99%) in the sample were two-parent families. Only five families were single-parent families. The sample characteristics for the parent-child paired-participants families were summarized in Table 3.1, 3.2 and 3.3. Two key indicators were used to reflect the family socioeconomic status (SES) of the participating families: parental education and parental occupation. For parental education, most parents were well-educated: 354 fathers (82%) and 337 mothers (78%) had attained bachelor's degrees or above. For parental occupation, 182 mothers (42%) and 8 fathers (2%) were full-time homemakers. While 200 fathers (46%) and 110 mothers (26%) were professionals, 191 fathers (44%) and 99 mothers (23%) were managers and administrators. Over 95% of the participating families lived in private housing (either privately-owned or private-rental). In a densely populated city with a widely known of sky-high housing prices like Hong Kong, the fact that families could afford private housing is also a good family SES indicator. Besides, over 80% of the participating families employed one or more domestic helpers to help take care of their children and housework at home. In terms of the usual languages at home, there were 203 fathers (47%) and 209 mothers (49%) who spoke mostly English at home and over 80% of both fathers and mothers spoken more than one language at home. In other words, most parents were bilingual or multilingual. Most of the parents believe that preschool period is an important time for developing children's English literacy skills (89%) and that they, as parents, play an important role in helping the development of their children's English literacy (96%). In terms of the household size, apart from 141 one-child families (33%), there were 232 two-child families (54%), 54 three-child families (12%) and 5 four-child families (1%). In sum, this sample reflects a socially homogeneous population with relatively well-educated parents and higher household income middle-class families in Hong Kong.

(A): Particulars of the parents	Father		Mother	
Parental education				
Doctorate or above	16	4%	7	2%
Postgraduate (PgDip. or Master's)	166	38%	133	31%
Bachelor's degree	172	40%	197	46%
Sub-degree (Higher Dip.)	20	5%	40	9%
Secondary School (F.7 or below)	45	10%	47	10%
Others (incl. missing)	13	3%	8	2%
Parental occupation				
Full-time Homemakers	8	2%	182	42%
Professionals	200	46%	110	26%
Managers & Administrators	191	44%	99	23%
Craft and related workers	1	0.5%	0	0%
Clerks	1	0.5%	10	2%
Service & shop sales	6	1%	7	1%
Others (incl. missing)	25	6%	24	6%
Usual language at home				
Chinese	176	41%	164	38%
English	203	47%	209	49%
Asian languages (Japanese, Korean etc.)	28	7%	36	8%
European languages (French, German etc.)	18	4%	18	4%
Other languages (incl. missing)	7	1%	5	1%
Number of languages spoken at home				
1	81	19%	67	16%
2	173	40%	166	38%
3	143	33%	155	36%
4	24	6%	34	8%
≥ 5	5	1%	6	1%
Missing	6	1%	4	1%

(B): Home Environment	Frequency	Percentage
Type of Family Housing		
Privately-owned	219	50%
Private-rental	200	46%
Government Quarters	7	2%
Public Housing	3	1%
Others	3	1%
Number of Family Members		
3	119	28%
4	220	51%
5	79	18%
≥ 6	14	3%
Number of Siblings		
0	141	33%
1	232	54%
2	54	12%
3	5	1%
Number of Domestic Helpers		
0	70	16%
1	278	64%
2	73	17%
3	8	2%
≥ 4	3	1%

Table 3.1: The sample characteristics for the parent-child paired-participants families

Parental Beliefs of Early Childhood Literacy Development	Frequency	Percentage
Preschool period is important for developing children's English literacy		
Strongly Agree	241	55.8%
Somewhat Agree	144	33.3%
Neither Agree nor Disagree	24	5.6%
Somewhat Disagree	20	4.6%
Strongly Disagree	2	0.5%
Missing	1	0.2%
Parents play an important role in developing children's English literacy		
Strongly Agree	303	70.1%
Somewhat Agree	112	25.9%
Neither Agree nor Disagree	11	2.6%
Somewhat Disagree	5	1.2%
Strongly Disagree	0	0%
Missing	1	0.2%

Table 3.2: The parental beliefs of early childhood literacy development

Particulars of Siblings	Sibling 1		Sibling 2	
Gender				
Male	152	52%	28	47%
Female	139	48%	31	53%
Age				
Below 3 years old	113	39%	31	53%
3 – 6 years old	94	32%	18	31%
6 – 10 years old	61	21%	8	13%
Above 10 years old	22	7.7%	2	3%
Missing	1	0.3%	-	
Speak English at home				
Yes	250	86%	48	81.3%
No	36	12.3%	10	17%
Missing	5	1.7%	1	0.3%
Number of languages spoken at home				
0	19	6%	9	15%
1	147	51%	32	54%
2	98	34%	12	20%
3	21	7%	4	6.7%
4	1	0.3%	1	1.7%
Missing	5	1.7%	1	1.7%

Table 3.3: The particulars of siblings of the participating preschool children

3.2. The Measuring Instruments

The theoretical constructs PCRQ, IPCLI, FPCLI, HLR, AK, EW, PA and CP are abstract theoretical concepts (or latent variables) that cannot be directly measured. However, each latent variable can be measured indirectly by specific observed variables. The following measuring instruments were selected to operationalize these theoretical constructs. They are chosen primarily based on their psychometric properties in previous research studies and their feasibilities in the context of this empirical study.

3.2.1. Emergent Literacy Measure

Apart from the required range of emergent literacy skill domains to assess and the two key psychometric properties (i.e. reliability and validity), the selection of the emergent literacy (EL) measuring instrument was also governed by a number of practical constraints in the context of this empirical study. For instances, administration *time* of the assessment per child should be short given the limitations of assessing the children at the age of about 4-year-olds in preschool environment. The administration *procedures* of each assessment should be standardized and consistent, which not only enhance the smooth assessment processes, but also allow meaningful and accurate comparison between the preschool children's emergency literacy skills.

Get Ready to Read!-Revised (GRTR!-Revised) (National Center for Learning Disabilities, 2009) was selected as the EL measuring instrument in this empirical study because it fulfilled the stringent psychometric requirements and addressed all the practical constraints. GRTR!-Revised is an early childhood English literacy test that assesses preschool children's emergent literacy skills across multiple domains: alphabet knowledge, emergent writing, phonological awareness, and print concepts (Massetti, 2009; Phillips et al., 2009; and Spencer et al., 2013). It is a standardized norm-referenced assessment instrument with a total of 25 test items. It takes about 10-15 minutes to administer the test for each preschool child of ages 3–5 years old. The items of the GRTR!-Revised test are designed in a multiple choice format where each item requires a preschool child to point to one of four pictures as the best answer in response to an orally presented question. For example, when the researcher presents to a child the page of the first test item that has four pictures showing four different ways of a book being positioned, the researcher reads aloud the question word-for-word as it is written: "*These are pictures of a book. Find the one that shows the back of the book.*" The preschool child answers by pointing to the correct picture. The researcher marks the preschool child's score for each test item on a standardized answer sheet. The response categories are coded "1" for a correct response and "0" for an incorrect response for each test item. All 25 test items were administered to each child and at the end of each GRTR!-Revised test, the researcher summed up all correct answers as the total Number Correct Score. The GRTR!-Revised instruction manual details two methods of interpreting the scores in the form of Step Score and Performance Level. The GRTR!-Revised test item content and skill domains are summarized in Table 3.4 below.

Previous research studies have provided evidence to support the utility of GRTR!-Revised test as a reliable and valid measure of children's emergent literacy skills. The original 20-item GRTR! test (Whitehurst, 2001) was technically validated for its psychometric properties based on a sample of 342 preschool children in the ages 3–5 years old in the United States. It had been evaluated in a series of empirical studies by comparing it with a number of comprehensive and well-established emergency literacy skill measures and demonstrated that it had acceptable criterion validity, concurrent validity and predictive validity (Molfese et al., 2004; Molfese et al., 2006; and Phillips et al., 2009). During the period of 2001–2008, over 350,000 children had been assessed by using the 20-item GRTR! test in the United States (Lonigan & Wilson, 2008).

In the mid-2008, the original 20-item GRTR! test was revised in order to increase the range of difficulty of the measure so that it could be used for testing preschool children with relatively higher levels of emergent literacy skills. The development of the 25-item GRTR!-Revised test was based on a normative sample of N=866 preschool children in the ages 3–5 years old, a representative sample of the US population. Lonigan and Wilson (2008) reported that the GRTR!-Revised test had a high internal consistency reliability (alpha=0.88). They have further evaluated the criterion validity of the GRTR!-Revised test by its correlations with the Test of Preschool Early Literacy (TOPEL) (Lonigan et al., 2007), a well-established standardized comprehensive diagnostic assessment measure, for three different components of emergent literacy skills: print knowledge, phonological awareness and definitional vocabulary[14]. They reported that the 25-item GRTR!-Revised test scores correlated significantly with the TOPEL scores in all three subtests and the TOPEL's overall Early Literacy Index scores (r_s ranged from 0.39 to 0.76). In another evaluation study by Wilson and Lonigan (2009), which used TOPEL as the criterion measure to compare the GRTR!-Revised against another similar widely-used literacy test, it was demonstrated that the GRTR!-Revised had adequate and better test-retest reliability and concurrent validity. In a recent study of a large combined sample of 1,351 preschool children in the ages ranged from 31 to 74 months, Farrington and Lonigan (2013) also reported that the 25-item GRTR!-Revised test had a high internal consistency (alpha=0.85). Using Item Response Theory (IRT) analysis, they demonstrated that the GRTR!-Revised test had adequate item-level reliability and it provided sufficient measurement precision for a majority of the preschool children assessed across a wide range of children's emergent literacy skill levels. Besides, they used Differential Item Functioning (DIF) analyses to demonstrate that the GRTR!-Revised test item properties were not influenced by most child characteristics. In other words, the GRTR!-Revised test items functioned independently of child characteristics such as gender and ethnicity.

[14] Definitional vocabulary describes preschool children's deeper understanding of vocabulary knowledge. It is a more complex domain of oral language skills than *receptive vocabulary* (e.g. point-to-picture) and *expressive vocabulary* (e.g. picture-naming) skills. It requires children's ability to formulate or explain the meaning of words and the use of words. For instances, when a child is shown a picture of an object (e.g. a spoon) and is asked to name the object in the picture, the child responds to say: "spoon" (i.e. a test of the expressive vocabulary). Next, when the child is further asked with follow-up questions related to the picture of the object such as, "What is it used for?" "When do you use it?" and "How do you use it?" etc. This is a test of the definitional vocabulary.

Item	Content	Skill Domain	Observed Variable
1	Find the picture that shows the back of the book.	CP	cp1Y14
2	Find the picture with letters.	CP	cp2Y15
3	Find the picture with letters.	CP	cp3Y16
4	Find the picture with a word.	CP	cp4Y17
5	Find the picture that shows the name of the cereal.	CP	cp5Y18
6	Find the letter R.	AK	ak6Y19
7	Find the letter G.	AK	ak7Y20
8	Find the letter that makes a /s/ sound.	AK	ak8Y21
9	Find the letter that makes a /t/ sound.	AK	ak9Y22
10	Find the letter that makes a /b/ sound.	AK	ak10Y23
11	Find the letter F that is written the best.	EW	ew11Y34
12	Find the name that is written the best.	EW	ew12Y35
13	Find the longest story.	EW	ew13Y36
14	Find the picture of the word that starts with the /b/ sound.	PA	pa14Y25
15	Find the picture of the word that starts with the /d/ sound.	PA	pa15Y26
16	Find the picture of the word that rhymes with “ball”.	PA	pa16Y27
17	Find the picture of the word that is “sea –shell”.	PA	pa17Y28
18	Find the picture of the word that is “pen –guin”.	PA	pa18Y29
19	Find the picture of the word that is “m –oon”.	PA	pa19Y30
20	Find the picture of the word that rhymes with “arm”.	PA	pa20Y31
21	Find the picture of the word that rhymes with “hat”.	PA	pa21Y32
22	Find the picture that has numbers in it.	AK	ak22Y24
23	Find the one that shows how to write two words.	EW	ew23Y37
24	Find the word that is written the best.	EW	ew24Y38
25	Find the picture that is “scar” without “sss”.	PA	pa25Y33

Table 3.4: GRTR!-Revised: Item content and skill domains

3.2.2. Home Literacy Resource Measure

The construct of home literacy resource (HLR) of English language materials was measured by three specific items adapted from the questionnaire designed by Senechal et al., (1998) and the Home Literacy Environment Checklist developed by the USA's National Center for Learning Disabilities (NCLD–HLEC, 2010). Parents were asked to estimate the amount and extent of English literacy resource at home by using the following items: number of English picture books for the child; number of stimulating toys and games that could help the child learn alphabets; number of English non-print materials for the child. Besides, the frequency of the child seeing a parent reading English print materials (e.g. English books, magazines or newspapers etc.) at home was also included to provide general background information about the preschool child's home literacy environment.

3.2.3. Parent-Child Literacy Interaction Measure

The parent-child literacy interaction is conceptualized as consisting of two dimensions: IPCLI and FPCLI. Both constructs were measured systematically by specific items adapted from the questionnaire designed by Senechal et al., (1998) and the Home Literacy Environment Checklist developed by National Center for Learning Disabilities (NCLD–HLEC, 2010). The IPCLI construct was measured by three specific items: frequency of storybook reading by parents in a typical week both at bedtime and other occasions; and frequency of requests by the preschool child for reading storybook in a typical week as an indicator of child's interest in book reading. Besides, other items about frequency of library visits with the preschool child and age of the preschool child when parents started reading to him/her were also included to provide general background information about the preschool child's home literacy environment.

The FPCLI construct was measured by another three specific items that assess the frequency of direct parent-teaching behaviors about English literacy at home. It was a 5-point Likert scale that indicated the frequency in a typical week in which parents teach their preschool child alphabet knowledge; teach their preschool child to read words; and teach their preschool child to print words. All these IPCLI and FPCLI items had been used in previous research studies as cited by Senechal et al., (1998) and the internal consistency coefficient of alpha=0.79 was reported.

3.2.4. Parent-Child Relationship Quality Measure

In order to capture the information of parental satisfaction as the surrogate measure of the parent-child relationship quality, I used a modified version of the three-item Umberson’s (1989) Parent-Child Relationship Quality (PCRQ) Scale with additional two items from Bingham’s (2002) measure and one item from Shek’s (1996) measure of parent-child relationship quality. This adapted PCRQ measure satisfied the criteria specified in Section 2.5.3 and it comprised a total of six items on a 4-point Likert scale that examined parent-child relationship quality in terms of parental satisfaction in various aspects of parenting. These six items included: “How satisfying do you find being a parent is?”; “How happy are you with the way your child behave?”; “All in all, how well would you say you get along with your child?”; “All in all, how enjoyable are you being a father or mother of this child?”; “All in all, how would you rate the quality of your relationship with your child?”; “How satisfied are you with your relationship with your child?”. Umberson (1989) reported that her 3-item scale had a strong internal consistency coefficient of alpha=0.94. Shek (1996) provided the test-retest reliability data of the Umberson’s 3-item scale and indicated that the scale was reasonably stable over a two-week period (r=0.73). Bingham’s (2002) reported that his two additional items had demonstrated a good internal consistency coefficient of alpha=0.81.

3.3. The Child's Family Background Information

The standard questionnaire also included other survey questions to provide the general background information about each preschool child's family, particularly in terms of his/her family structure, family socioeconomic status, languages spoken at home and the information of other immediate family members (e.g. siblings, grandparents and domestic helpers etc.) who were living together with the child in the household. This background information could vary considerably that could provide the researcher with additional knowledge in understanding and interpretation of the assessment results of the child's home literacy environment and his/her literacy development.

3.4. The Questionnaire Design

In this empirical study, the PCRQ, IPCLI, FPCLI and HLR measures were all survey questions for parents to answer. I used self-administered survey mode to deliver the survey questions to the selected parents through a standard questionnaire. From the survey methodology perspective, this survey mode means that the selected parents have to process the survey questions and navigate through the standard questionnaire by themselves. As such, it is important that the question format, components of each question (incl. question stem, additional instructions, and answer spaces or response options), visual presentation of the questions and the entire questionnaire are designed in a holistic manner so that they can work effectively together ‘in concert’ to convey the meaning of each question and ensure the respondents to comprehend each question as intended in order for the parents to reliably produce accurate data about the theoretical constructs (Dillman et al., 2009). Since the PCRQ, IPCLI, FPCLI and HLR measures in this research study do not serve as a replication of previous surveys to generate new research results for comparison, it is appropriate to improve the survey questions and questionnaire design in order to maximize response rate and minimize measurement error in the context of this empirical study.

The original question design for the PCRQ, IPCLI, FPCLI and HLR measures were primarily closed-ended ordinal questions. Using this question format in the context of this empirical study had various pitfalls that might lead to substantial measurement error and lower response rate unless it was properly addressed prior to data collection. Consider the original IPCLI, FPCLI and HLR questions that measured gradations about the frequency of parent-child literacy interactions and the counting of English literacy resources in the home literacy environment respectively. Each question provided an ordered set of answer categories as the response options. Each answer category represented to a greater or lesser extent that the respondents had to decide where they fitted along the continuum. Take the original form of one IPCLI question as an example: “*During a typical week, how often does your child ask to be read to? Choose a number from 1 to 5, where 1 means never and 5 means very often.*” The response options were: “*(1) Never; (2) Seldom; (3) Sometimes; (4) Often and (5) Very Often*”. Research had shown that using these vague quantifiers to describe the answer categories was so imprecise that respondents interpreted the ordinal scale differently because they often assigned different meaning to each category among the categories offered and hence prevented them from providing meaningful answers (Dillman et al., 2009). While some respondents would consider one time every day to be "*Very Often*", others would consider three times every day to be "*Very Often*". Take another example, the original form of one HLR question: "*Please estimate the number of children's English picture books that are available in your home.*" The response options were: "*None; 1-20; 21-40; 41-60; 61-80 and > 100*". Research had shown that many respondents would use the response categories provided as a guide to help them formulate their answers by assuming that the range emphasized in the scale represented full range of responses and the middle category would reflect the average position (Dillman et al., 2009). In other words, the respondents used the response categories provided as representing the distribution of the population characteristic in formulating their answers. As a result, instead of actually counting the number of children's English picture books available at home, the respondents would decide their answers based on their assumptions made about the scale range and the midpoint and hence their answers were bound to be influenced. Therefore, using the original closed-ended ordinal question format for the IPCLI, FPCLI and HLR questions would increase measurement error.

In order to measure the IPCLI, FPCLI and HLR constructs more accurately and effectively, the original closed-ended ordinal question format was converted to an open-ended numeric question format with a measurement goal of getting the respondents to provide a single number (or amount) for the answer. This open-ended numeric question format was preferred because the respondents could report an exact number for each question that was more precise and accurate information and thereby avoided the influences from the original set of answer categories where the respondents had to choose an answer from the answer categories with vague quantifiers. In other words, it allowed the respondents to freely provide a numerical answer to each question without limiting their response. Besides, several strategic question design techniques suggested by Dillman et al., (2009) were also applied to make sure that each question was easy to read and comprehend and visually well-designed so as to encourage only valid response from the respondents. Take the above IPCLI question as an example; it was converted to "*In an average week, how many times does the Child ask you (including your spouse) to read English books with him or her?*" Three important features were incorporated: the *desired unit* was specified in the question stem; an appropriately sized *answer box* was provided for the response task; and the *unit label* was provided close to the end of the answer box.

Consider the original PCRQ questions that measured gradations about the levels of attitudes (or satisfaction) of the parents. Again, each question provided an ordered set of answer categories as response options. Each answer category represented a higher or lower level of parental satisfaction that the respondents had to decide where they fitted along the continuum. Take the original form of one PCRQ question as an example: "*How satisfied are you with your relationship to your child?*" The response options were: "*(1) Very satisfied; (2) Pretty satisfied; (3) Not too satisfied; (4) Not at all satisfied*". Although using this closed-ended ordinal question format to measure the PCRQ construct was feasible, there were at least three problems in this question design that might cause bias in responses. First, the question stem only states one side of the construct "satisfied". The question structured in this way might send an implicit message to the respondents that satisfied was the "right" answer and hence it might encourage more people to report satisfied than actually did (Dillman et al., 2009). In other words, it would produce artificially positive responses "satisfied" as a result of stating only one side of the construct in the question stem. Second, the response options was a unipolar ordinal scale that could only measure gradations along one dimension (intensity level) where the zero point was at one end of the scale (from "*Very satisfied*" to "*Not at all satisfied*"). Third, some respondents, who were undecided, would not be able to answer the question because there was no applicable answer in the response options. As a result, they might skip the question leaving it unanswered. As such, it was impossible to differentiate this "undecided" situation from actual missing values by the respondents. These pitfalls in combination might prevent the respondents from giving accurate and precise answers. Therefore, using this original closed-ended ordinal question format for the PCRQ questions would increase measurement error.

In order for the respondents to provide more precise measurement data for the PCRQ construct, an improved question design based on the guidelines for designing closed-ended ordinal question suggested by Dillman et al., (2009) was incorporated. Take the above PCRQ question as an example; it was revised to "*How satisfied or dissatisfied are you with your relationship to the Child?*" The revised response options were: "*Very satisfied; Moderately satisfied; Slightly satisfied; Neutral; Slightly dissatisfied,* *Moderately dissatisfied; Very dissatisfied; [Don't know, Not sure]*" Three important features were incorporated. First, the question stem was rebalanced by stating both sides of the construct and hence it conveyed to the respondents that dissatisfaction was an acceptable answer and the ordinal scale had a greater range. Second, a bipolar ordinal scale was used to measure both the direction ("satisfied" or "dissatisfied") and the intensity level ("very", "moderately", "slightly") of the construct where the zero point was at the middle of the scale. This provided a balanced scale with three positive and three negative categories on each side of the middle category "Neutral". In addition, a relatively equal conceptual distance between the categories was used that allowed the respondents to express their attitudes more precisely. Third, undecided categories "*Don't know*" and "*Not sure*" were offered to ensure that the question provided all reasonable and possible answers so that every respondent could find an applicable answer. Furthermore, these nonsubstantive categories were placed at the end of the bipolar scale and were graphically separated from the substantive response options by additional space in order that the visual midpoint could align with the conceptual midpoint of the bipolar ordinal scale.

Apart from the above important features in question design that had been incorporated thoroughly into the PCRQ, IPCLI, FPCLI and HLR measures, an effective questionnaire design was considered and applied in this self-administered survey mode as well. Based on the perspective of social exchange theory, Dillman et al., (2009) suggest that a respondent-friendly questionnaire design can encourage and motivate people to respond because it establishes *trust* (as the questionnaire is professionally designed) and increases perceived *rewards* (as the questionnaire is interesting and socially important) while reducing perceived *cost* of responding (as the questionnaire is easy to navigate and complete). In other words, it reduces nonresponse error while at the same time improves response rates. Furthermore, it reduces measurement error because it encourages the respondents to process the questions completely in the prescribed order and as intended and hence minimize the influences between different questions in the questionnaire ("*question order effects*"). Three important aspects of a good questionnaire design had been implemented in the standard questionnaire.

First, all related questions were grouped together according to topics and organized in a logical order for the respondents. Apart from the sections for PCRQ, HLR, PCLI measures and the child's family background, two introductory sections "*The Child's Particulars*" and "*Early Childhood Literacy Development*" were added to this standard questionnaire. *"The Child's Particulars"* section helped the researcher to determine the eligibility of the preschool child participant who should be in the age ranging from 3-year-9-month to 4-year-3-month at the time of this research assessment. The "*Early Childhood Literacy Development*" section aimed to encourage parents' participation because it consisted of two simple closed-ended ordinal questions that consistently reflected the purpose of the entire standard questionnaire as explained in the research letter of participation to parents. They were applicable and relevant to the parents because the questions asked about their beliefs as parents on early childhood literacy development. In other words, all parents could answer these two initial questions very easily. These additional features of simplicity, applicability and consistency encouraged response from the parents by promoting trust, increasing perceived rewards while reducing perceived costs of completing the questionnaire (Dillman et al., 2009). "*The Child's Family Background*" section was more sensitive and thus it was placed in the end of the standard questionnaire after the parents had answered the more salient questions for the PCRQ, HLR, IPCLI and FPCLI measures and had been engaged with the standard questionnaire. This approach also prevented interrupting the flow of the standard questionnaire that might happen if these questions were asked abruptly at the beginning or in the middle.

Second, several effective visual design features had been applied in the design and organization of this standard questionnaire to help the respondents speed up their visual processing and improved comprehension and hence encouraged them to navigate through the sections and to complete the individual questions in the intended order. The standard questionnaire was constructed in a simple 10"×7" booklet format to fit into a 11" × 8" stamped return pre-addressed envelope for mailing. On the front cover, a title "Early Childhood Literacy Development Questionnaire" was used to describe what this standard questionnaire was about and broadly appealed to all the participating parents. A brief statement was included to generally describe the study. An interesting color family picture depicting the home literacy environment where parents teach their children how to read and write was incorporated. This was immediately identifiable to all parents caring about their children's early literacy development. In each page, the questions were vertically aligned to the left in a single-column format with relatively more vertical spacing between questions to help respondents organize the information on the page and group related information in the standard questionnaire. A lightly shaded background was consistently used to enclose each individual question. This defined a rectangular region for the question and allowed the use of white answer spaces and hence it helped respondents to organize information clearly and identify where to record their answers quickly. In other words, it helped respondents to focus their attention on the question and eased their response task. In the end of this standard questionnaire, additional color pictures were included to continue the visual appeal to the parents and asked for their additional comments about the study. The address for mailing back the standard questionnaire was also repeated in the end page of the questionnaire.

Finally, pre-testing the standard questionnaire was conducted to check and identify potential problems (e.g. question wording, question order, and visual design problems etc.) prior to the implementation and data collection. Cognitive interview[15] was used to test the standard questionnaire. A cognitive interview between a respondent and an interviewer was primarily designed to help the interviewer identify potential problems of the questions in the standard questionnaire and examine the underlying causes of the problems and hence followed up with appropriate actions if necessary. For pre-testing this standard questionnaire, I selected 10 potential respondents and conducted ten cognitive interviews. I asked them individually to respond to the standard questionnaire in my presence as an interviewer. In each interview, I explained to the respondent the purpose of the cognitive interview and that he/she would complete the standard questionnaire in a special way by telling me everything he/she was thinking (a think-aloud answering process) while he/she processed each question and developed his/her answer. In this process, I probed so that I could understand how each question was interpreted by each respondent and I could check whether the intent of each question could be realized. If the respondents interpreted a question differently, it indicated that the question had to be improved. Based on the analysis of the evidence provided by all the cognitive interviews, three major changes had been incorporated. First, special instructions were integrated into the question stem in order to clarify the meaning of the question more effectively. Consider the HLR questions as examples, specific instruction for counting different English literacy items ("*Please count only the*

[15] Cognitive interview is used by researcher to determine whether respondents comprehend the questions in the questionnaire as intended; and whether respondents can answer the questions accurately (Dillman et al., 2009).

number of English picture-books for the Child") was added and strategically located within the question and the specified item was underlined as the target for counting. Besides, in order to avoid double counting of different English literacy items into the same question, examples of the specified items for counting were also provided ("*e.g. Old MacDonald and My First ACB Board Book etc.*"). Second, an additional HLR question was added and located immediately before a specific HLR question to help the respondents comprehend the meaning of the question and hence avoided unnecessary confusion in answering the question. Third, the question on "Monthly Household Income" was deleted because of its sensitive nature in the context of this empirical study. Most respondents in the cognitive interviews reported that they were very reluctant to provide their family financial information. Since this question was in the section "*The Child's Family Background*, it would not affect the PCRQ, HLR, IPCLI and FPCLI measures. Besides, there were two other questions on parents' highest education level and parents' occupation that could be used to reflect the socioeconomic status of the respondents. For the final standard questionnaire design completed, a pilot study was conducted with a selected kindergarten. The results indicated that the standard questionnaire and the implementation of the data collection procedures worked well. All the participating parents in the kindergarten returned their questionnaires. Besides, no particular item non-response problems were identified. The survey questions for the PCRQ, HLR, IPCLI and FPCLI measures are summarized in Table 3.5 below.

Construct		Item Content	Observed Variable
HLR	1.	How many English Non-print materials for the Child (e.g. AV and Digital materials such as Baby Einstein DVD and other CD-ROMs etc.) are available in your home to help the Child learn English? Please count only the number of English Non-print materials for the Child. (*If it is a set of DVD series with 6 DVDs, it should be counted as 6 numbers of English Non-print materials*).	hlrY1
	2.	How many English picture-books for the Child (e.g. Old MacDonald and My First ABC Board Book etc.) are available in your home? Please count only the number of English picture-books for the Child.	hlrY2
	3.	Other than books, how many other children items in your home with English print (e.g. wall charts, flash cards and games etc.) may be used to help the Child learn English? Please count only the number of children items with English print.	hlrY3
	4.	In an average week, how many times do YOU (including your SPOUSE) read English print materials (e.g. English newspapers, English magazines and English books etc.) AT HOME?	hlrY4
	5.	In the occasions specified in Question 4 above, how many times does the Child see you (including your spouse) reading English print materials AT HOME?	hlrY5
IPCLI	1.	In an average week, how many NIGHT(S) do you (including your spouse) read English books to the Child at bedtime?	ipcY6
	2.	In an average week, how many times do you (including your spouse) read English books to the Child at other times?	ipcY7
	3.	In an average week, how many times does the Child ask you (including your spouse) to read English books with him or her?	ipcY8
	4.	In an average MONTH, how many times does the Child go to libraries (including kindergarten libraries and/or public libraries) to borrow English books?	ipcY9
	5.	How old was the Child when you (and/or your spouse) STARTED reading English books to him or her? Please report only the age in MONTH(s) when the Child was first read to in English since birth.	ipcY10
FPCLI	1.	In an average week, how many times do you (including your spouse) teach the Child the letters' names (e.g. A, B, C …) and/or letters' sounds (e.g. "C" = /k/) of the English alphabet?	fpcY11
	2.	In an average week, how many times do you (including your spouse) teach the Child how to read English words (e.g. shovel, painting, ankle …)?	fpcY12
	3.	In an average week, how many times do you (including your spouse) teach the Child how to write English letters (e.g. A, B, C …) and/or English words?	fpcY13
PCRQ	1.	How satisfying or dissatisfying do you find being a parent is?	pcr16X1
	2.	How happy or unhappy are you with the way the Child behaves?	pcr17X2
	3.	Overall, how well or unwell would you say you get along with the Child?	pcr18X3
	4.	Overall, how enjoyable or unenjoyable are you with being a parent of the Child?	pcr19X4
	5.	Overall, how would you rate the quality of your relationship with the Child?	pcr20X5
	6.	How satisfied or dissatisfied are you with your relationship to the Child?	pcr21X6

Table 3.5: The survey questions for the PCRQ, HLR, IPCLI and FPCLI constructs

3.5. Statistical Methods

As discussed previously, it is important that the measurement error associated with the observed variables is explicitly taken into account through appropriate statistical methods. Otherwise, the estimates of structural relationships between the theoretical constructs in the hypothesized theoretical models are bound to be biased. This leads to the methodological issue that concerns the choice of an appropriate statistical analysis strategy.

Structural equation modeling (SEM) methodology was used as a preferred statistical method for empirical testing and evaluation of the hypothesized mediation structural models developed in this research study. SEM is primarily a theory-based approach for testing a theory among multiple variables. There are two major advantages for the use of SEM that are related to both structural issue and measurement issue as compared with traditional multiple regression analysis. First, SEM permits *simultaneous estimation* of all the hypothesized dependence relationships in a theoretical model while multiple regression analysis can only examine a single dependence relationship at a time (Iacobucci et al., 2007; and Hair et al., 2010). From a structural point of view, it provides an assessment of *overall model fit* of a hypothesized structural model as a whole to the empirical data as well as an assessment of *local fit* for each structural relationship in the model. Thus, SEM offers increased capabilities in analyzing and testing theoretical models of complex phenomena.

Second, SEM can explicitly take the *measurement error* into account in analyzing the hypothesized structural relationships by incorporating a *measurement model* for measuring each of the associated theoretical constructs. From a theoretical perspective, a complex theoretical construct (latent variable) is better measured by using multiple items (observed variables) than measured by using any single item. Furthermore, all measurement is necessarily subject to measurement error. However, multiple regression analysis replaces the theoretical constructs by observed variables, which implicitly assumes no measurement error associated with the measurement of each theoretical construct in the analysis and hence it results in biased estimates of the structural parameters in the model. The ability of SEM to provide the measurement model that can account for the extent of the measurement error improves the statistical estimation of the structural relationships between the theoretical constructs (Hair et al., 2010). In other words, it integrates both the structural model and measurement model to empirically test and evaluate the structural relationships in the theoretical model. As a result, it gives a more accurate estimation of the hypothesized structural relationships between the constructs in the theoretical model.

In SEM approach, the theoretical model comprises both the structural model and the measurement model. It is important to test and validate the measurement model before examining the structural model (Hair et al., 2010; and Kline, 2011). Confirmatory factor analysis (CFA) was used as a preferred statistical method to assess the validity of the measurement model. CFA is basically a theory-driven approach with *a priori* theoretical specification of the measurement model that is formulated to operationalize the theoretical construct and it can be used to develop a more satisfactory measuring instrument for each theoretical construct in the model (Steenkamp & van Trijp, 1991; Aish & Wasserman, 2001; Brown, 2006; Hair et al., 2010; and Kline, 2011). Thus, CFA was applied to assess each of the measuring instruments with the following three specific objectives: (1) to test the hypotheses about dimensionality; (2) to investigate the psychometric properties of the individual items and hence select the most valid and reliable items for each measuring instrument; and (3) to refine each measurement model with reduced number of items (*if applicable*) that can be used for testing the hypothesized structural models. LISREL 8.80 for Windows (Joreskog & Sorbom, 2006), one of the most widely used computer statistical programmes, was applied to perform both CFA and SEM in this empirical study. The path diagrams with LISREL notation for the two hypothesized mediation structural models incorporating their associated measurement models (for simplicity, not all observed variables are included) are shown in Figure 3.1 and Figure 3.2 below.

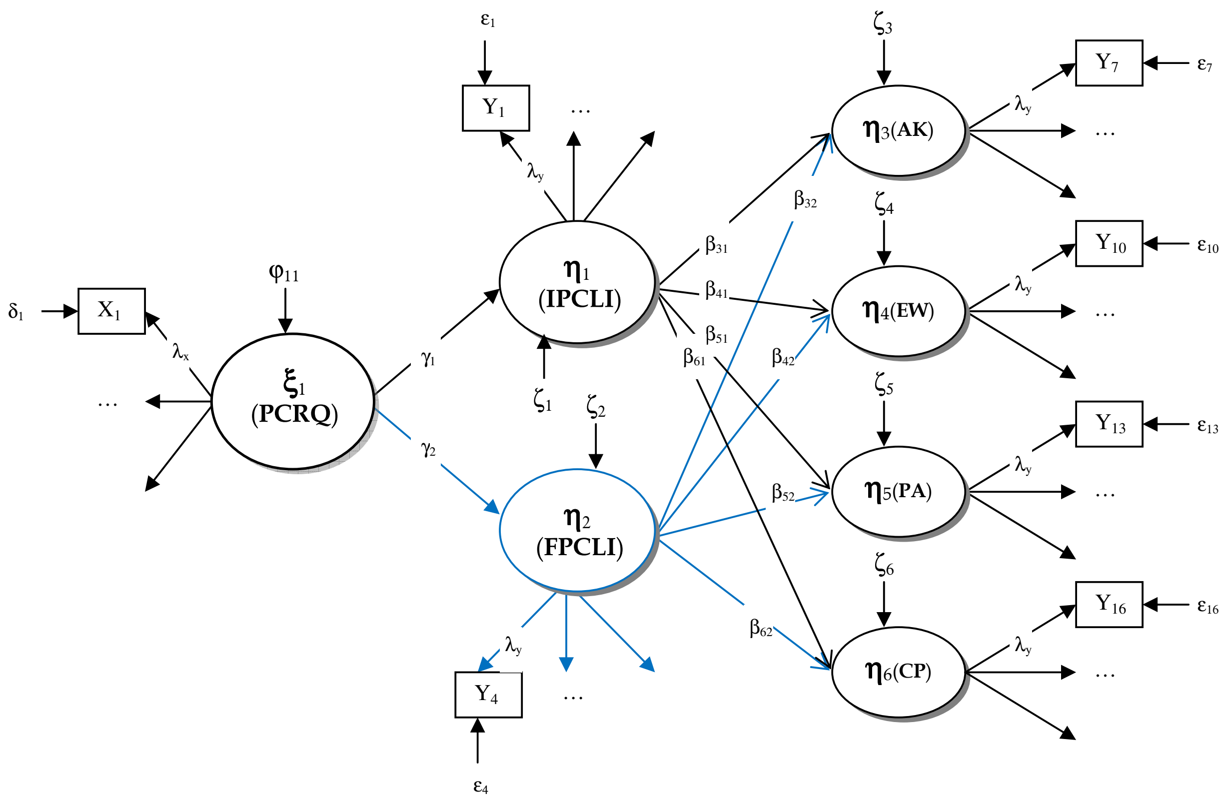

Figure 3.1: Path diagram for the proposed PCLI Mediation Model with LISREL notation

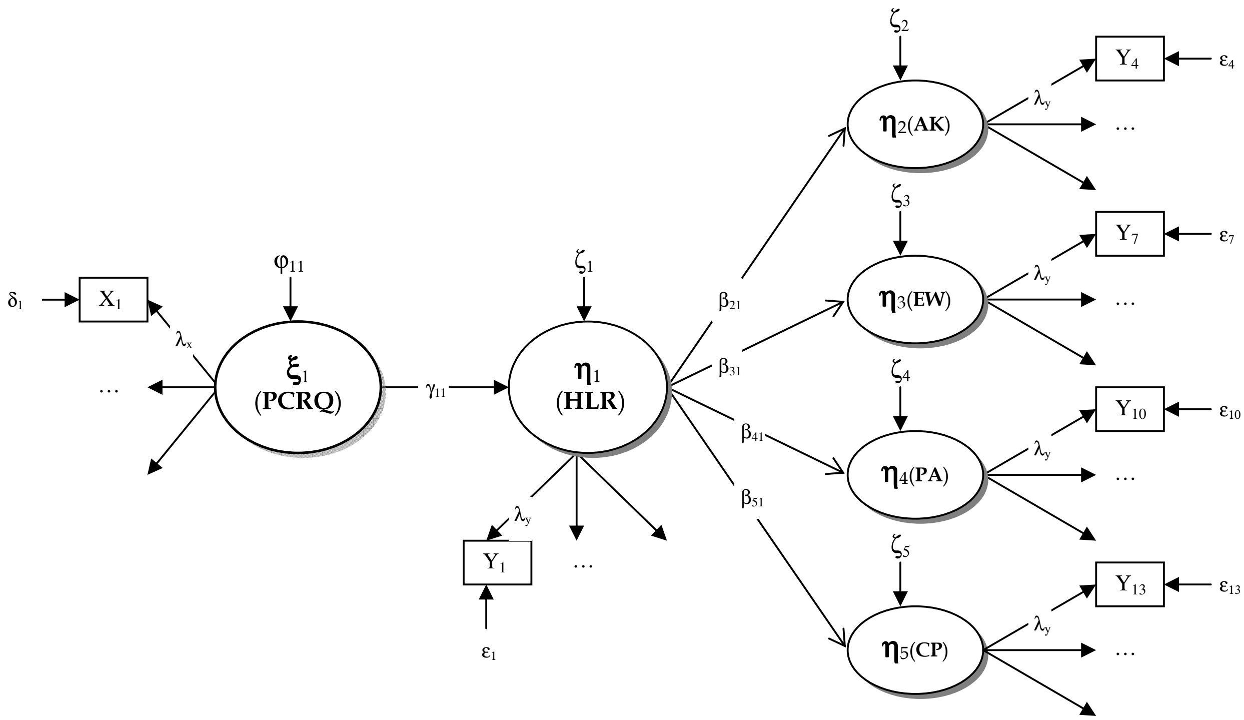

Figure 3.2: Path diagram for the proposed HLR Mediation Model with LISREL notation

Chapter 4: Data Analysis and Results

4.1. Data Screening and Preparation

In data entry process for the sample of 432 parent-child paired participants, a structured data entry procedure was implemented to match each standard questionnaire to its corresponding GRTR!-Revised test standardized answer sheet by using the same coding system[16]. Immediately after inputting data for each parent-child paired participant, each data point was double-checked for error and re-entered if it was incorrect. After completion of the data entry process for all the 432 parent-child paired participants, data entry errors were screened and checked by using SPSS Statistics 20.0 Frequencies for all the variables. Incorrect data points were identified and re-entered with correct data and SPSS Statistics 20.0 Frequencies were re-run for checking again. As an initial step prior to data analysis, data screening and preparation procedures were conducted in order to evaluate the issues involving missing data, potential outliers and normality assumption that might unduly affect the results.

All the 432 preschool children completed the 25-item GRTR!-Revised test. These 25 literacy test items have complete and valid data. Missing data occurred in the returned standard questionnaires by the participating parents and they were mainly due to non-responses, undecided answers (e.g. "Don't know" and "Not sure") and invalid answers (e.g. "Many" instead of providing a numerical answer). The level of missing data on both case-basis and variable-basis and the overall extent of missing data across all the cases were examined. Table 4.1 contains the summary statistics for all the observations with valid values and the percentage of cases with missing data on each variable in the sample. The largest number of missing data per variable is four cases for two variables hlr7Y5 and pcr16X1 (i.e. 0.93% of the sample). Twelve out of twenty three variables have no missing data. Furthermore, by looking at the amount of missing data per case, 411 cases have no missing data (i.e. 95.14% of the sample). The largest number of missing data per case is three and only one case (i.e. 0.23% of the sample) has three missing values. Further examination on the patterns of the missing data does

[16] To ensure anonymity, each child's name was transformed into Response Code, Child Code and Literacy Code. These codes were entered into the SPSS and all the responses were recorded against these codes. The same coding system was used for both the standard questionnaire and the GRTR!-Revised test standardized answer sheet. Thus, there were no personal identifiers in the database.

not indicate any nonrandom patterns in the sample dataset such as concentration of missing values in a specific set of items. As such, no variables or cases are deleted because of excessive levels of missing data. Since the overall extent and the level of missing data on both case-basis and variable-basis are acceptably low[17] and there are no specific nonrandom patterns of the missing data, the missing data process is considered as Missing Completely At Random (MCAR), which allows the widest range of imputation methods for accommodating the missing data without the concern of creating biases in the sample that will markedly affect the results (Hair et al., 2010: p.47–50). Since only 21 cases (i.e. 4.86% of the sample) have missing data and the sample size of 411 cases is sufficiently large as representative for the entire sample for data analysis, the complete case method (also known as the LISTWISE method – a default method in SPSS Statistics 20.0) is used as the appropriate method to deal with the missing data. It is the most conservative approach that provides two advantages in this instance. First, the consistency in the correlation matrix can be maintained. Second, no replacement values are introduced into the dataset and hence it will not create any biases that affect the results. Therefore, the effective sample size is 411 cases that have complete and valid data on all the concerned variables for data analysis in this empirical study.

The 13 home literacy environment variables were considered in outlier analyses based on both univariate and multivariate perspectives for detecting potential outliers in the sample. By applying the rules of thumb suggested by Hair et al. (2010) for large sample size, cases of a variable with standardized scores exceeding a threshold value of ±4.0 indicate potential univariate outliers. For multivariate outlier assessment of each case across the set of home literacy environment variables, the Mahalanobis distance (D) statistic is used through an approximate significance test. Hair et al. (2010) suggested that for large sample size, cases with D^2/df value ($df = 13$) exceeding a threshold value of 4.0 indicate potential multivariate outliers. Table 4.2 contains the outlier detection results from both the univariate and multivariate perspectives. These potential outliers identified were re-examined on a case-by-case basis to evaluate their nature of uniqueness. From the univariate perspective, only 9 cases (i.e. 2.08% of the sample) exceed the threshold value on more than a single variable. When these cases were re-examined in further details, they do not have values that are so extreme as to affect any of the overall

[17] As a rule of thumb, missing data under 10% for an individual case or observation can generally be ignored unless the missing data occurs in a specific nonrandom pattern (Hair et al., 2010).

statistics (e.g. mean and standard deviation) of the variables. From the multivariate perspective, 14 cases (i.e. 3.24% of the sample) are identified as significantly different and they also appear in the univariate outlier analysis on one or more variables. This indicates that they are not only unique in a combination of the 13 home literacy environment variables, but also unique on any single or more variables. However, these identified potential outliers are all valid cases and they are considered substantively as representative of a viable segment in the context of the study population. Therefore, these cases are retained here for data analysis to ensure generalizability to the study population.

Items by subscale	Cases	Mean	SD	Range	Missing Data	
					Number	%
HLR						
hlrY1	429	34.83	55.76	0-900	3	0.69%
hlrY2	429	71.91	89.40	2-770	3	0.69%
hlrY3	430	19.76	63.32	0-1000	2	0.46%
hlrY4	430	10.52	48.58	0-1000	2	0.46%
hlrY5	428	5.45	5.80	0-50	4	0.93%
IPCLI						
ipcY6	432	4.89	2.38	0-7	0	0%
ipcY7	432	4.23	3.70	0-30	0	0%
ipcY8	432	5.43	4.23	0-35	0	0%
ipcY9	431	2.9	2.52	0-20	1	0.23%
ipcY10	432	10.10	8.55	0-46	0	0%
FPCLI						
fpcY11	431	5.00	6.20	0-70	1	0.23%
fpcY12	430	4.96	7.05	0-100	2	0.46%
fpcY13	432	3.16	3.52	0-35	0	0%
PCRQ						
pcr16X1	428	6.29	1.01	1-7	4	0.93%
pcr17X2	429	6.21	0.90	2-7	3	0.69%
pcr18X3	432	6.62	0.72	2-7	0	0%
pcr19X4	431	6.74	0.54	4-7	1	0.23%
pcr20X5	432	6.71	0.55	3-7	0	0%
pcr21X6	432	6.65	0.63	2-7	0	0%
EL score	432	16.37	4.11	2-25	0	0%
STEP score	432	2.89	0.63	1-4	0	0%
Performance Level	432	2.35	0.64	1-3	0	0%
Child's Age (Months)	432	47.91	1.99	44-51	0	0%

Summary of Cases

Number of Missing Data per Case	Number of Cases	Percent of Sample
0	411	95.14
1	17	3.94
2	3	0.69
3	1	0.23
Total	432	100.00

Table 4.1: Summary statistics of missing data in the sample

Univariate Outliers		Multivariate Outliers		
Items by subscale	Cases with *z* scores > ± 4.0 on each standardized variable	Cases with D^2/df > 4.0 (df=13)*		
		Cases	D^2	D^2/df
HLR		316	56.6	4.35
hlrY1	9, 100	340	63.6	4.89
hlrY2	177, 185, 256, 269, 359	412	68.6	5.28
hlrY3	152, 256, 359, 360, 376	185	69.1	5.32
hlrY4	No cases	121	70.8	5.44
hlrY5	196, 207, 265	359	76.4	5.88
IPCLI		315	96.8	7.45
ipcY6	No cases	265	111.2	8.55
ipcY7	265, 340, 412, 427	266	125.1	9.62
ipcY8	121, 265, 340, 412	196	141.5	10.88
ipcY9	49, 64	88	210.4	16.18
ipcY10	93	360	251.9	19.38
FPCLI		100	262.5	20.19
fpcY11	86, 88, 266, 315, 316, 340	256	272.8	20.99
fpcY12	316, 315, 340, 360			
fpcY13	266, 315, 316, 354, 355, 360, 430			

Table 4.2: Univariate and multivariate outlier detection results for the sample

* Mahalanobis D^2 value is based on the set of 13 home literacy environment variables.

4.2. Descriptive Statistics

For the purpose of data analysis, the home literacy environment variables were converted back into a five-ordered level of answer categories according to its original[18] scale. It is legitimate to convert the numerical answers of each home literacy environment variable into five levels of answer categories that measure the graduations of a greater or lesser frequency along a continuum based on percentile of the sample distribution for the variable. Take one IPCLI variable ipcY10 as an example: "*In an average week, how many times does the Child ask you (including your spouse) to read English books with him or her?*" The five-level continuum are defined as "*1 = Never*" for all the numerical answers of zero time; "*2 = Seldom*" for the interval of first 25 percentile; "*3 = Sometimes*" for the interval from 25 to 50 percentile; "*4 = Often*" for the interval from 50 to 75 percentile; and "*5 = Very Often*" for the interval from 75 to 100 percentile. Table 4.3 summarizes the descriptive statistics of the sample (N=411) for the home literacy environment variables after conversion and the PCRQ variables. The mean age of the preschool children in the sample was 47.92 months (i.e. 3 years 11 months). The mean scores for the six PCRQ variables show that the parent-child relationship was good in this sample. On a scale of 1–7, all the mean scores are above 6.0, suggesting that the parents are satisfied with their parent-child relationship, rating the quality of parent-child relationship as good, enjoyable being a parent, getting along well with their child, happy with their child's behavior and satisfied being a parent.

Two empirical measures for describing the shape characteristics of a distribution (skewness and kurtosis) are used to assess normality of the variables. Based on the rules of thumb suggested by Kline (2011), variables with absolute values of skewness > 3.0 and absolute values of kurtosis > 10.0 are problematic. These mean that values of skewness above +3.0 or below -3.0 indicate extremely skewed distribution and values of kurtosis above +10.0 or below -10.0 indicate "extreme" kurtosis and hence denote a significant departure from normality for the variable concerned. As shown in Table 4.3, all the 23 variables have absolute values of skewness < 3.0 and absolute values of kurtosis < 10.0 (except for variable pcr21X6 where kurtosis = 12.053). The PCRQ variables have relatively more negative skewness and more positive kurtosis than the other variables in

[18] As discussed in Section 3.4, each home literacy environment variable was converted from a closed-ended ordinal question format to an open-ended numeric question format in order to obtain more precise and accurate information from the respondents in the data collection process.

the sample and hence indicate deviation from normality. However, Hair et al. (2010) suggested that severity of non-normality is based on both the shape characteristics of the distribution and the sample size. Larger sample sizes (e.g. $N \geq 200$) reduce the detrimental effects of non-normality. Given that the effective sample size of 411 in this empirical study can be considered as sufficiently large, the effects of non-normality in these variables may be negligible. In other words, the shape characteristics of these variables reveal relatively little or minor effects of non-normality in the sample and should not present any serious problems in the data analysis. Besides, the original form of these variables is preferable for comparability in the interpretation phase. Thus, no data transformation is necessary and the original form is used in the data analysis.

On the other hand, it is important to point out that all the PCRQ and home literacy environment observed variables are primarily *ordinal variables* for data analysis in SEM in this empirical research study. By definition, because of the *discrete nature* of ordinal variables, they are *not* continuous data and hence these ordered categorical data *cannot* be normally distributed, which means that it is *not* appropriate to analyze them by treating them *as if* they were *continuous variables* (Joreskog, 1990; 1994; 2005; and Kaplan, 2009), where normal-theory estimators based on product-moment correlations (e.g. Maximum Likelihood: ML[19]) are usually applied in SEM (Finney & DiStefano, 2006; and Kline, 2011). Otherwise, it can attenuate the estimates of the correlations among the observed variables that lead to *negatively biased* parameter estimates (DiStefano, 2002; Flora & Curran, 2004; Finney & DiStefano, 2006; Kline, 2011; and Moshagen & Musch, 2014), especially in the instances "*where marked floor or ceiling effects exist in purportedly interval-level measurement scales*" (Brown, 2006: p.387). In addition, it can produce incorrect model fit indices (e.g. inflated model χ^2 statistics that increase the tendency of rejecting correctly specified models); and incorrect standard errors of the parameter estimates that can lead to higher risk of Type I error (Brown, 2006). In other words, it is important to choose a theoretically appropriate *estimation method* based on the right type of correlation matrix for the analysis with ordinal variables in SEM.

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[19] Maximum Likelihood (ML) is a normal-theory estimator that is based on product-moment correlations and is the default estimation method in most SEM software programmes (incl. LISREL 8.80). It is the most widely used estimation method in the applied research literature for data analyses in SEM with *continuous variables*. When all the underlying set of assumptions such as independent observations, correctly specified model, continuous data and multivariate normality etc. are thoroughly satisfied, ML is an appropriate and efficient estimator to produce accurate model fit statistics and standard errors, consistent and unbiased parameter estimates (Flora & Curran, 2004; Finney & DiStefano, 2006; Kaplan, 2009; and Kline, 2011).

In order to address the problems associated with analyzing the ordinal variables, I have chosen and implemented Weighted Least Squares (WLS) estimation method based on polychoric correlations for analyzing the ordinal variables in LISREL 8.80 in this present research study. WLS is an *asymptotically distribution-free* (ADF) estimator that does not require the assumptions of *multivariate normality* and *continuous data*; and therefore, observed variables that are kurtotic have no detrimental effect on the ADF χ^2 values or standard errors (Flora & Curran, 2004; Finney & DiStefano, 2006; and Joreskog & Sorbom, 2006). The WLS estimation method based on polychoric correlations has been theoretically developed to purposely address the problems encountered in the analysis with ordinal variables in SEM; with its ability to produce asymptotically unbiased and consistent parameter estimates, correct standard errors and model fit statistics under non-normality and when some or all of the observed variables are ordinal (Joreskog, 1990; 1994; and 2005; Flora & Curran, 2004; and Kaplan, 2009). A brief historical development and detailed formulae of this ADF approach are given by Flora & Curran (2004); and Kaplan (2009). While applying the ML estimator based on product-moment correlations for the analysis with ordinal variables in SEM can produce substantially biased parameter estimates, standard errors and model fit statistics; the results from prior research studies, based on computer simulations, have consistently demonstrated the superiority of the WLS[20] estimation method based on polychoric correlations for analyzing ordinal variables in SEM that it can produce consistent and asymptotically unbiased parameter estimates, correct standard errors and model fit statistics at *larger* sample sizes (e.g. DiStefano, 2002; Flora & Curran, 2004; Simsek & Noyan, 2012; and Moshagen & Musch, 2014).

The GRTR!-Revised test item content, skill domains and percentage correct for each test item are summarized in Table 4.4, which shows that the preschool children's performance in the test is generally good in most items in this sample. On a scale of 1–25, the mean Number Correct score is 16.37, suggesting that the preschool children

[20] A drawback of applying this full WLS estimation method is its frequent criticism that the calculation of asymptotic covariance matrix requires a large sample size in order to produce stable estimates (Flora & Curran, 2004). More specifically, as suggested by Joreskog and Sorbom (1996), a minimum sample size of $(k + 1)(k + 1)/2$, where k = the number of observed variables in a model, is required for the estimation of the weight matrix. Given the effective sample size of N = 411 (i.e. exceeds the minimum sample size required) in this empirical study, it can most likely produce convergence of the WLS estimator, unbiased parameter estimates, accurate standard errors and model fit statistics for the hypothesized theoretical model.

scored more than 12 test items correct out of the 25-item GRTR!-Revised test. On a scale of 1–4, the mean Step Score is 2.89, suggesting that the preschool children scored above Step 2 level in the development of emergent literacy skills and this indicates that the preschool children have more than a basic understanding of books and print and can recognize some letters. The mean Performance Level score is 2.35 out of 3.00, suggesting that the preschool children's performance in this sample is between the '*Average*' and '*Above Average*' levels against the GRTR!-Revised test norm-referenced scale derived for interpreting preschool children's Number Correct score in relation to the scores of other children in the same age range.

Items* by subscale	Mean	S.D.	Skewness	Kurtosis
HLR				
hlrY1a	3.36	1.128	-0.179	-0.737
hlrY2a	3.27	1.010	0.299	-0.995
hlrY3a	3.25	1.057	0.129	-0.631
hlrY4a	3.08	0.936	0.274	0.018
hlrY5a	3.13	1.162	-0.057	-0.817
IPCLI				
ipcY6a	3.80	1.309	-0.771	-0.640
ipcY7a	3.02	1.084	0.088	-0.812
ipcY8a	3.10	1.106	0.003	-0.950
ipcY9a	2.53	1.111	0.342	-0.443
ipcY10a	2.66	1.186	0.066	-1.110
FPCLI				
fpcY11a	2.88	1.048	0.002	-0.711
fpcY12a	2.83	1.144	-0.045	-0.895
fpcY13a	2.60	1.131	0.275	-0.907
PCRQ				
pcr16X1	6.30	1.002	-1.747	3.364
pcr17X2	6.23	0.879	-1.590	3.424
pcr18X3	6.62	0.682	-2.424	8.407
pcr19X4	6.74	0.539	-2.264	5.594
pcr20X5	6.72	0.529	-2.143	6.618
pcr21X6	6.65	0.632	-2.709	12.053
Number Correct Score	16.37	4.146	-0.484	0.031
Step Score	2.89	0.626	-0.034	-0.187
Performance Level	2.35	0.646	-0.482	-0.689
Child’s Age (Months)	47.92	1.968	-0.018	-1.136

Table 4.3: Descriptive statistics for the sample (N = 411)

* Note: all the items by subscale have complete and valid data.

Item	Content	Skill Domain		% Correct
1	Find the picture that shows the back of the book.	CP	cp1Y14	64.0
2	Find the picture with letters.	CP	cp2Y15	71.8
3	Find the picture with letters.	CP	cp3Y16	68.4
4	Find the picture with a word.	CP	cp4Y17	81.0
5	Find the picture that shows the name of the cereal.	CP	cp5Y18	62.5
6	Find the letter R.	AK	ak6Y19	86.9
7	Find the letter G.	AK	ak7Y20	92.7
8	Find the letter that makes a /s/ sound.	AK	ak8Y21	89.1
9	Find the letter that makes a /t/ sound.	AK	ak9Y22	79.1
10	Find the letter that makes a /b/ sound.	AK	ak10Y23	77.6
11	Find the letter F that is written the best.	EW	ew11Y34	78.6
12	Find the name that is written the best.	EW	ew12Y35	64.0
13	Find the longest story.	EW	ew13Y36	88.3
14	Find the picture of the word that starts with the /b/ sound.	PA	pa14Y25	69.1
15	Find the picture of the word that starts with the /d/ sound.	PA	pa15Y26	78.1
16	Find the picture of the word that rhymes with “ball”.	PA	pa16Y27	30.9
17	Find the picture of the word that is “sea –shell”.	PA	pa17Y28	76.6
18	Find the picture of the word that is “pen –guin”.	PA	pa18Y29	71.3
19	Find the picture of the word that is “m –oon”.	PA	pa19Y30	65.2
20	Find the picture of the word that rhymes with “arm”.	PA	pa20Y31	24.1
21	Find the picture of the word that rhymes with “hat”.	PA	pa21Y32	27.3
22	Find the picture that has numbers in it.	AK	ak22Y24	78.6
23	Find the one that shows how to write two words.	EW	ew23Y37	34.3
24	Find the word that is written the best.	EW	ew24Y38	47.4
25	Find the picture that is “scar” without “sss”.	PA	pa25Y33	30.7

Table 4.4: GRTR!-Revised: Item content, skill domains and % correct for the sample (N=411)

4.3. CFA and SEM with LISREL 8.80

LISREL 8.80 for Windows is a suite of software programmes (incl. PRELIS 2.80) that embraces the ADF approach for the analysis with ordinal variables in CFA and SEM. As the preprocessor for LISREL, PRELIS 2.80 provides tools for preliminary data analyses and checking assumptions about the data. In general, the estimation of the theoretical model in LISREL in this empirical research study involved two main stages: (1) PRELIS stage – estimate the polychoric correlations and their asymptotic covariance matrix for the observed variables; and (2) LISREL stage – estimate the model parameters by the WLS estimator based on the consistent estimate of the asymptotic covariance matrix of the estimated polychoric correlations. In estimating the polychoric correlations among the ordinal variables in the theoretical model, it is important to test the assumption of *bivariate normality* for each pair of the underlying *latent response variables* (Flora & Curran, 2004; and Kaplan, 2009). Although there is research evidence to support that polychoric correlations are robust to violations of bivariate normality of the underlying latent response variables (Quiroga, 1992), PRELIS 2.80 provides an RMSEA measure of population discrepancy for test of close fit for the underlying bivariate normality. Based on a series of computer simulation studies for the variations of different degree of underlying bivariate non-normality, Joreskog (2005) suggested that when RMSEA ≤ 0.1, there are no serious effects of bivariate non-normality of the underlying latent response variables.

In PRELIS stage, I had applied PRELIS 2.80 to initially conduct data screening for the sample dataset after importing the screened sample dataset from the SPSS Statistics 20.0. This provided information about univariate distribution for each of the observed variables for further checking. The data screening results agreed exactly with the results determined by the previous SPSS Statistics 20.0 data screening procedures and hence provided solid bases to continue further data analysis in LISREL. Afterwards, I applied PRELIS 2.80 to estimate the polychoric correlations among the ordinal variables and compute their asymptotic covariance matrix for each of the measurement models. Each polychoric correlation matrix with polychoric correlations for all the pairs of the observed variables in each measurement model is shown in the corresponding PRELIS output file. The polychoric correlation matrix for each of the measurement models was examined thoroughly and patterns of polychoric correlations in each correlation matrix provided preliminary evidence for convergent validity and discriminant validity of a measurement model prior to confirmatory factor analyses. More importantly, I examined thoroughly the degree of underlying bivariate non-normality by checking the RMSEA value and the P-value for the test of the hypothesis that the population value of RMSEA is less than 0.1 for each pair of the observed variables in each of the measurement models. The results showed that all the RMSEA values are less than 0.1 in each of the measurement models, which suggest that the hypothesis of approximate underlying bivariate normality is accepted for each pair of the observed variables in each measurement model.

In LISREL stage, a measurement model was specified and identified. Afterwards, CFA with LISREL 8.80 was applied to test and evaluate the measurement model with WLS estimation method. Evaluation of the measurement model validity is based on the assessment of overall model fit between the observed sample covariance matrix and the estimated covariance matrix; and the assessment of local fit for each of the free parameter estimates in the measurement model (e.g. factor loadings, factor correlations and error variances etc.). Assessment of the overall measurement model fit provides necessary and sufficient information to determine dimensionality of the model (Steenkamp & van Trijp, 1991; and Hair et al., 2010). As a rule of thumb, multiple key Goodness-of-Fit (GOF)[21] statistics were used to evaluate the overall fit of a model. These include Chi-square statistic (χ^2), Normed Chi-square, Root Mean Square Error of Approximation (RMSEA) and Comparative Fit Index (CFI). However, in practice, it should be noted that "*GOF must be interpreted in light of the characteristics of the research… It is simply not practical to apply a single set of cutoff rules that apply for all SEM models of any type*" (Hair et al., 2010: p.652). Otherwise, it would potentially exclude meaningful research.

Assessment of the local fit for the free parameter estimates in the measurement model provides necessary information to determine the validity and reliability of each individual item of a measuring instrument (Hair et al., 2010). A factor loading represents the validity of an item in the model and it is the extent to which the item actually reflects its associated theoretical construct it is designed to measure. Reliability of an item in the model represents how well the item measures its associated theoretical construct and it

[21] In SEM, a Goodness-of-Fit (GOF) statistic is a measure that indicates how well the specified theoretical model reproduces the observed sample covariance matrix among the observed variables.

is the extent to which the item's variance is explained by the associated theoretical construct. It is also referred to as the squared multiple correlations (R^2) for each observed variable in the model. As a rule of thumb, a significant standardized factor loading should be at least 0.40 (preferably 0.70 or higher) and item reliability should ideally exceed 50% (Hair et al., 2010; and Kline, 2011). In addition, average variance extracted (AVE)[22] and construct reliability (CR)[23] are used as summary indicators to examine convergent validity and internal consistency of the measurement model respectively. Factor correlations are used to examine discriminant validity of the measurement model. In applied social research, Brown (2006) suggested that a significantly high factor correlation (e.g. $\phi \geq 0.85$) indicates problematic discriminant validity of the measurement model. Generally, when the CFA results suggest good overall model fit and evidence of construct validity, construct reliability and discriminant validity is present, the measurement model validity is supported.

Based on the validated measurement model, the hypothesized structural model was specified. SEM with LISREL 8.80 was applied to test and evaluate the validity of the specified structural model and estimate the hypothesized structural relationships in the structural model. Evaluation of the structural model validity is based on the assessment of overall structural model fit; and the assessment of local fit for each of the structural parameter estimates in the proposed theoretical model. The assessment of overall structural model fit follows the same criteria of GOF statistics as those used for the assessment of the measurement model fit together with a comparison of overall model fit between the measurement model and the structural model. The measurement model fit provides a useful baseline for the assessment of the overall structural model fit (Hair et al., 2010). Since the hypothesized structural model is a recursive structural model (no feedback loops), the number of specified structural relationships in SEM is always smaller than the number of factor correlations in CFA (except for a saturated structural model). Thus, the hypothesized structural model can only have a higher χ^2 value than the associated measurement model validated. Finally, the structural parameter estimates

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[22] AVE = $(\sum\lambda_i^2)/n$ where λ_i is the *standardized factor loadings* and n is the number of items of a theoretical construct in a measurement model. An AVE value is calculated for each theoretical construct and AVE ≥ 0.50 suggests adequate convergence in a measurement model (Hair et al., 2010).

[23] CR = $(\sum\lambda_i)^2/[(\sum\lambda_i)^2 + (\sum\delta_i)]$ where λ_i is the *standardized factor loadings* and δ_i is the *error variance terms* of a construct in a measurement model. A CR valued is calculated for each theoretical construct and CR ≥ 0.70 indicates good construct reliability (or internal consistency) in the measurement model (Hair et al., 2010).

of the dependence structural relationships (incl. both direct and indirect effects) specified in the theoretical model were examined and evaluated against the corresponding hypotheses.

Apart from the above evaluation guidelines, LISREL 8.80 provides additional model diagnostic information such as standardized residuals and modification indices for examining both the measurement model and structural model. These model diagnostics may indicate sources of misfit (or problems) and suggest ways to further improve the respective model. However, the model may be modified, re-fitted and re-evaluated only if it can be justified by strong theoretical basis to ensure theoretical integrity of the overall model (Brown, 2006; Hair et al., 2010; and Kline, 2011).

4.4. CFA for PCRQ Measurement Model

Consider the PCRQ measuring instrument. If the six PCRQ items measure the one–dimension PCRQ theoretical construct as hypothesized, there should be a clear correspondence between the values of the latent variable PCRQ and the categories in each of the six ordinal variables. In this case, there should be a positive association between the latent variable PCRQ and each ordinal variable. However, from the theoretical perspective, items pcr16X1 and pcr18X3 are ambiguous. For the item pcr16X1, a parent who has high PCRQ with his/her child might be dissatisfied being a parent in the sense that he/she has not done good enough in terms of certain aspects in their daily life (e.g. having not enough time with the child). For the item pcr18X3, it is more sensible that a parent who can get along well with his/her child in their daily life will develop a high level of PCRQ. In other words, the latent variable PCRQ is not a prerequisite for both items pcr16X1 and pcr18X3. Therefore, in principle, these two items should be excluded from the confirmatory factor analysis.

CFA with LISREL 8.80 was applied to test the unidimensionality of the 6–item PCRQ measurement model. The significant Chi-square test statistic $\chi^2(9, N=411)=31.350$ (p=0.000) indicates that the 6-item PCRQ model does not fit the sample dataset although the RMSEA (0.08) and CFI (0.99) appear acceptable. Examination of the standardized residuals does indicate that both pcr16X1 and pcr18X3 items are problematic, which is consistent with theoretical expectations. Accordingly, the PCRQ measurement model was re-specified by eliminating these two items. Correlation matrix for the resulting four items of the PCRQ measure is summarized in Table 4.5. The 4-item PCRQ measurement model fits the data very well, which suggests that a unidimensional PCRQ measurement model is obtained: $\chi^2(2, N=411) = 2.839$ (p=0.242); χ^2/df (1.420); RMSEA (0.032) and CFI (1.000).

Variable		1	2	3	4
1.	pcr17X2	–			
2.	pcr19X4	.637	–		
3.	pcr20X5	.646	.728	–	
4.	pcr21X6	.669	.759	.920	–

Table 4.5: Intercorrelations of observed variables for the PCRQ measurement model
Note: Intercorrelations are statistically significant at $p < .01$.

All the four standardized factor loadings exceed 0.70 and are statistically significant (p<0.01). The item's reliability (R^2) ranges from 0.54 to 0.96 that is greater than the 50% rule of thumb. The estimates of AVE (0.76) and CR (0.93) further suggest adequate convergent validity and construct reliability for the one-factor PCRQ measurement model. Therefore, the CFA results provide sufficient evidence to support the validity of the 4-item PCRQ measurement model with the one-factor structure as hypothesized. Table 4.6 and Table 4.7 summarize the CFA assessment results for the PCRQ measurement model. The path diagram for the 4-item one-factor PCRQ model with standardized parameter estimates is shown in Figure 4.1.

Description of PCRQ Model	χ^2	*df*	*p*-value	χ^2/df	RMSEA	CFI
6-item PCRQ measurement model: (pcr16X1, pcr17X2, pcr18X3, pcr19X4, pcr20X5, pcr21X6)	31.350	9	0.000	3.483	0.078	0.994
4-item PCRQ measurement model: (pcr17X2, pcr19X4, pcr20X5, pcr21X6)	2.839	2	0.242	1.420	0.032	1.000

Table 4.6: Goodness-of-Fit statistics for the PCRQ measurement model

Variable		Standardized Factor Loading	S.E.	*t*-value	R^2
(1).	pcr17X2	0.737	0.044	16.849	0.543
(2).	pcr19X4	0.820	0.036	22.909	0.672
(3).	pcr20X5	0.933	0.023	39.961	0.871
(4).	pcr21X6	0.981	0.019	51.445	0.962
		AVE = 0.76			CR = 0.93

Table 4.7: CFA model assessment results for the PCRQ measurement model
Note: Significant at the 0.01 level (N = 411)

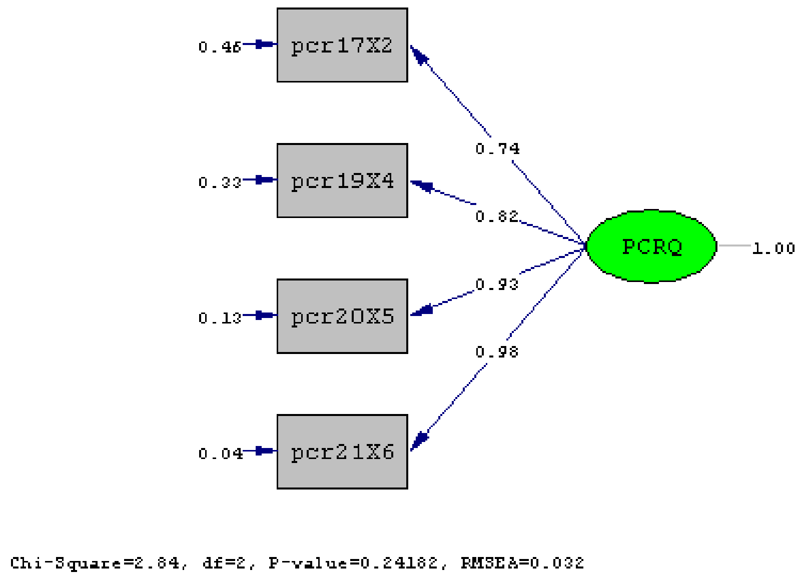

Figure 4.1: Path diagram with standardized parameter estimates for the one-factor PCRQ model

4.5. CFA for PCLI Measurement Model

As discussed previously, there are two main foci of the home literacy environment: HLR and PCLI. The PCLI is further conceptualized as consisting of two components, namely IPCLI and FPCLI. By definition, each of these three theoretical constructs is measured by three specific indicators: HLR is measured by items hlrY1a, hlrY2a and hlrY3a; IPCLI is measured by items ipcY6a, ipcY7a and ipcY8a; and FPCLI is measured by items fpcY11a, fpcY12a and fpcY13a. The other four home literacy environment items (hlrY4a, hlrY5a, ipcY9a and ipcY10a) are not considered as specific indicators for measuring any of these three theoretical constructs by definition. Apart from providing general background information about the home literacy environment, these four items help improve the effectiveness of the questionnaire design during the data collection stage. For example, the item hlrY4a was added to help the standard questionnaire respondents comprehend the meaning of the item hlrY5a.

The PCLI measure is specified as a congeneric measurement model in terms of two unidimensional theoretical constructs with the six corresponding observed variables. Strictly speaking, the IPCLI item ipcY8a is conceptually more ambiguous than the other two IPCLI items because it depends on the child to take initiatives to '*ask*' parents to read English books with him/her in an average week. However, the other two IPCLI items (ipcY6a and ipcY7a) refer to the parents who read English books to their child at bedtime and other times. Thus, in principle, the item ipcY8a should be excluded from the confirmatory factor analysis.

CFA with LISREL 8.80 was applied to test the hypothesized dimensionality of this PCLI measurement model. The significant Chi-square test statistic $\chi^2(8, N=411)=33.110$ (p=0.000) indicates that the 6-item PCLI model with the two-factor structure does not fit the sample dataset. The RMSEA (0.09) also indicates that the model does not fit the sample data well. Examination of the standardized residuals confirms the theoretical expectation that the item ipcY8a is problematic and causes the misfit in the model, where it is involved in two largest standardized residuals greater than |4.00|. As such, the PCLI measurement model was re-specified by eliminating this item ipcY8a. Correlation matrix for the resulting five items of the PCLI measure is summarized in Table 4.8. The 5-item PCLI measurement model of the two-factor structure (IPCLI: ipcY6a, ipcY7a; and FPCLI:

fpcY11a, fpcY12a, fpcY13a) fits the data very well: $\chi^2(4, N=411)=3.368$ ($p=0.498$); χ^2/df (0.842); RMSEA (0.000) and CFI (1.000), which suggests the acceptability of the two-factor structure for this PCLI measuring instrument. The standardized residuals range from -1.597 to 1.374, suggesting that there are no localized areas of ill fit in the CFA solution.

Variable		1	2	3	4	5
1.	ipcY6a	–				
2.	ipcY7a	.323	–			
3.	fpcY11a	.174	.357	–		
4.	fpcY12a	.149	.346	.672	–	
5.	fpcY13a	.130	.391	.675	.589	–

Table 4.8: Intercorrelations of observed variables for the PCLI measurement model

Note: Intercorrelations are statistically significant at $p < .01$.

All the standardized factor loadings exceed 0.70 (except for the item ipcY6a) and are statistically significant ($p<0.01$). Four out of the five items' reliability (R^2) exceeds 0.50. Besides, the estimates of AVE and CR exceed 0.50 and 0.70 respectively for the FPCLI construct. Although the item ipcY6a has a lower standardized factor loading ($\lambda_y=0.373$), it is statistically significant with a high *t*-value (5.469). This item ipcY6a is retained at this point to support the content validity, taking into account both the theoretical and practical considerations of the PCLI measuring instrument. The statistically significant factor correlation ($\phi=0.523$; $p<0.01$) between IPCLI and FPCLI constructs is consistent with theoretical expectations. The estimate of AVE for each factor is greater than the squared factor correlation estimate, which indicates good discriminant validity of the measurement model. In sum, the construct validity and construct reliability of the two-factor PCLI measurement model are considered as acceptable for the purpose of this study. Thus, the CFA results provide sufficient evidence to support the validity of the 5-item PCLI measurement model with the two-factor structure as hypothesized. Table 4.9 and 4.10 summarize the CFA assessment results for the PCLI measurement model. The path diagram for the 5-item two-factor PCLI measurement model with the standardized parameter estimates is shown in Figure 4.2.

Description of PCLI Model	χ^2	*df*	*p*-value	χ^2/df	RMSEA	CFI
6-item PCLI measurement model: (IPCLI: ipcY6a–8a; FPCLI: fpcY11a–13a)	33.110	8	0.000	4.139	0.088	0.972
5-item PCLI measurement model: (IPCLI: ipcY6a–7a; FPCLI: fpcY11a–13a)	3.368	4	0.498	0.842	0.000	1.000

Table 4.9: Goodness-of-Fit statistics for the two-factor PCLI measurement model

Construct validity and reliability estimates for the two-factor PCLI measurement model

Construct	Variable	Standardized Factor Loading	S.E.	*t*-value	R^2
IPCLI	(1). ipcY6a	0.373	0.068	5.469	0.139
	(2). ipcY7a	0.875	0.126	6.931	0.766
		AVE = 0.45			CR = 0.59
FPCLI	(3). fpcY11a	0.870	0.030	29.202	0.756
	(4). fpcY12a	0.777	0.033	23.422	0.603
	(5). fpcY13a	0.792	0.034	23.452	0.628
		AVE = 0.66			CR = 0.85

Factor correlation matrix (standardized) for the two-factor PCLI measurement model

	IPCLI	FPCLI
IPCLI	1.000	
FPCLI	0.523	1.000

Table 4.10: CFA model assessment results for the two-factor PCLI measurement model

Note: All significant at the 0.01 level (N = 411)

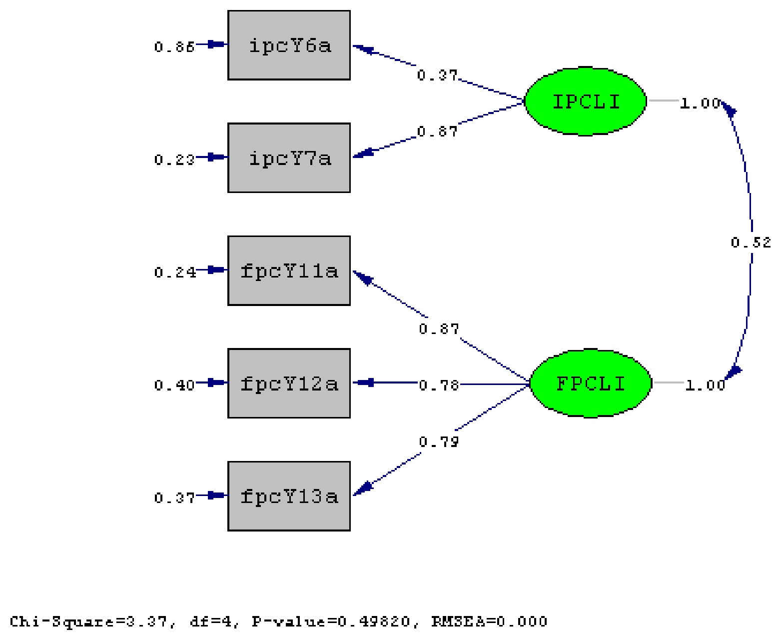

Figure 4.2: Path diagram with standardized parameter estimates for the two-factor PCLI model

4.6. CFA for EL Measurement Model

Theoretically, the content of the 25-item GRTR!-Revised measuring instrument assesses the preschool children across four emergent literacy skill domains: CP, AK, EW and PA. As such, it is a four-factor EL measurement model by definition. However, in the context of the development of the 25-item GRTR!-Revised and the original 20-item GRTR!, it is primarily used as a one–factor EL measure, where a composite score for preschool children's emergent literacy skills is obtained by summing up the total number of correct answers for each child assessed (Lonigan & Wilson, 2008; and Whitehurst, 2001). All previous research studies used the 25-item GRTR!-Revised or the original 20-item GRTR! as a one–factor EL measurement model and there was no detailed assessment of dimensionality of the scale except by Farrington and Lonigan (2013). They carried out a modified parallel analysis and exploratory factor analysis to evaluate the dimensionality of the 25-item GRTR!-Revised on a combined sample dataset (N=1,351) of preschool children in the ages ranged from 31 to 74 months and found that a two–factor model significantly fit the data better than the one-factor model.

In the context of this empirical study, it is important to identify the factorial structure of the EL measure in order to evaluate the hypothesized mediation structural models. Four factorial structures of the 25-item GRTR!-Revised were evaluated: one–factor EL model (EL) used in previous research studies; two–factor EL model (PK and PA) constructed by Lonigan and Wilson (2008) where CP, AK, and EW items were grouped as PK items; three–factor EL model (AK, EW and PA) where AK also included the CP items; and the four–factor EL model (CP, AK, EW and PA) by definition. Table 4.11 summarizes the main CFA assessment results. None of the four hypothesized factorial structures of the 25-item GRTR!-Revised fits the sample dataset and all CFA solutions do not converge. Examination of the correlation matrix of the 25-item GRTR!-Revised indicates that some items are weakly correlated with each other within the same factor in the model. Therefore, it is clear that eliminating those poorly performing items would resolve the multiple strains in the CFA solutions and hence develop a more effective EL measure.

Since the 25-item GRTR!-Revised constitutes conceptually four factors by definition where each factor possesses a congeneric set of items, it is technically feasible to analyze the items of one factor at a time to evaluate their unidimensionality before combing the factors for testing the factorial structure of the whole EL model (Joreskog, 2005). In this way, the CFA results provide useful information for identifying and deleting poorly performing items. As such, I tested and refined the four uni-factor models (CP, AK, EW and PA) separately. After eliminating the poorly performing items, each uni-factor measurement model has a reduced number of specific items and the resulting four uni-factor models fit the data very well as shown in Table 4.11. The factor loadings of all the specific items in each factor are statistically significant. However, the standardized factor loadings of the three items (cp1Y14, ew13Y36 and pa18Y29) are far below the conventional guideline (0.40). A low standardized factor loading indicates a fairly weak strength of the indicator-factor relationship. Thus, these three items were further eliminated when combining the four uni-factor models for evaluating the factorial structure of the whole EL measurement model. Examination of the correlation matrix among the specific items after combining the four uni-factor models provides further supportive evidence for eliminating these three weak items.

CFA with LISREL 8.80 was applied to test the resulting 13-item EL measurement model of the four–factor structure (CP: cp2Y15, cp3Y16, cp5Y18; AK: ak6Y19, ak7Y20, ak9Y22, ak10Y23; EW: ew11Y34, ew12Y35, ew24Y38; PA: pa14Y25, pa15Y26, pa16Y27). It fits the data reasonably well: $\chi^2(59, N=411)=99.438$ ($p=0.001$); χ^2/df (1.685); RMSEA (0.041) and CFI (0.963). However, the significantly high factor correlation ($\phi=0.937$; $p<0.01$) between CP and AK constructs indicates the lack of discriminant validity of the measurement model, which is expected because the content of the items cp2Y15 and cp3Y16 requires the skill domain of AK from the child and hence these CP items overlap conceptually with the AK items. Thus, the EL measurement model was re-specified by eliminating the CP factor completely.

Correlation matrix of the final ten items EL model is summarized in Table 4.12. This resulting 10-item EL model is specified and tested as the hypothesized three–factor congeneric measurement model (AK: ak6Y19, ak7Y20, ak9Y22, ak10Y23; EW: ew11Y34, ew12Y35, ew24Y38; PA: pa14Y25, pa15Y26, pa16Y27). The CFA results indicate that it fits the data reasonably well: $\chi^2(32, N=411)=57.545$ ($p=0.044$); χ^2/df (1.798); RMSEA (0.044) and CFI (0.969), which suggests the acceptability of the three–factor structure for this 10-item EL measurement model (See Table 4.11). The path diagram for this 10-item three–factor EL measurement model with the standardized parameter estimates is shown in Figure 4.3.

Description of the EL Model		χ^2	*df*	*p*-value	χ^2/df	RMSEA	CFI
The 25-item GRTR!-Revised:							
One-Factor EL Model	(EL)	Solution not admissible					
Two-Factor EL Model	(PK; PA)	Solution not admissible					
Three-Factor EL Model	(AK; EW; PA)	Solution not admissible					
Four-Factor EL Model	(CP; AK; EW; PA)	Solution not admissible					
The four uni-factor models:							
CP: cp1Y14, cp2Y15, cp3Y16, cp5Y18		3.730	2	0.155	1.865	0.046	0.971
AK: ak6Y19, ak7Y20, ak9Y22, ak10Y23		3.376	2	0.185	1.688	0.041	0.994
EW: ew11Y34, ew12Y35, ew13Y36, ew24Y38		0.339	2	0.844	0.170	0.000	1.000
PA: pa14Y25, pa15Y26, pa16Y27, pa18Y29		0.443	2	0.801	0.222	0.000	1.000
The 13-item EL model:							
4-Factor EL model: CP (3); AK (4); EW (3); PA (3)		99.438	59	0.001	1.685	0.041	0.963
The 10-item EL model:							
3-Factor EL model: AK (4); EW (3); PA (3)		57.545	32	0.004	1.798	0.044	0.969

Table 4.11: Goodness-of-Fit statistics for the EL measurement models

Variable		1	2	3	4	5	6	7	8	9	10
1.	ak6Y19	–									
2.	ak7Y20	.756	–								
3.	ak9Y22	.666	.427	–							
4.	ak10Y23	.521	.441	.477	–						
5.	ew11Y34	.162	.242	.180	.192	–					
6.	ew12Y35	.164	.055	.068	.208	.304	–				
7.	ew24Y38	.104	.010	.316	.095	.268	.231	–			
8.	pa14Y25	.362	.219	.554	.487	.156	.273	.246	–		
9.	pa15Y26	.426	.367	.605	.549	.180	.246	.243	.700	–	
10.	pa16Y27	.159	-.084	.268	.202	.176	.163	.236	.393	.346	–

Table 4.12: Intercorrelations of observed variables for the three-factor EL measurement model

Note: Intercorrelations are statistically significant at $p < .01$.

Table 4.13 summarizes the CFA assessment results for the 10-item three–factor EL measurement model. All standardized factor loadings are statistically significant (p < 0.01) and hence provide initial evidence of convergent validity. Besides, all the items' standardized factor loadings exceed 0.70 and all their item reliabilities (R^2) exceed 0.50, except for the items: ew11Y34, ew12Y35, ew24Y38 and pa16Y27. For the AK and PA constructs, all the estimates of AVE and CR exceed 0.50 and 0.70 respectively. Although the standardized factor loading of item pa16Y27 (λ_y=0.387) is lower than preferred, it is statistically significant with a high t-value (5.803) and it does not appear to attenuate the convergent validity or construct reliability of the model. As such, the item pa16Y27 is retained to support the content validity taking into considerations both theoretical and practical aspects of the EL measuring instrument. Only a few standardized residuals associated with the AK items and PA items exceed |2.50| and all the standardized residuals fall below |4.00|, the benchmark value that may indicate a problem with the measures. Examination of the modification indices provides consistent information with that obtained from the standardized residuals. For the EW construct, the estimates of AVE and CR fall below 0.50 and 0.70 respectively. All the EW items have lower standardized factor loadings than preferred: ew11Y34 (λ_y=0.483; t=5.201); ew12Y35 (λ_y=0.553; t=5.976) and ew24Y38 (λ_y=0.525; t=5.801). Theoretically, given the nature of the EW factor and the constraint of GRTR!-Revised by using multiple-choice[24] format for the test items, it is not unexpected for the lower performance of these EW test items. Empirically, these three EW items are statistically significant with high t-values and they do not appear to be significantly harming the overall model fit. Besides, all standardized residuals associated with these three EW items range from -1.966 to 1.771. Thus, these three EW items are considered adequate and are retained to preserve content validity of the EW construct for all practical purposes.

All three factor correlations (ϕ=0.442; 0.551; 0.782; p<0.01) are statistically significant and are consistent with theoretical expectations. The significantly high factor correlation (ϕ=0.782; p<0.01) between the AK and PA factors is expected because the contents of

[24] A better alternative to assess children's EW skills is to use a free-response format (i.e. recall). However, given the limitations of assessing preschool children at the age of about 4 years olds in the preschool environment, using a multiple-choice format (i.e. recognition) is preferred because it reduces the memory demands and hence it is easier for the children to respond to multiple-choice items than are equivalent items presented in a free-response format (Farrington & Lonigan, 2013).

the two PA items (pa14Y25 and pa15Y26) test the initial sound of an English word that requires prerequisite knowledge of alphabet letter sound from preschool children. Since there are no cross-loadings and correlated errors, it provides further evidence to support discriminant validity of the model. In sum, the construct validity and construct reliability of the three–factor EL measurement model are considered as acceptable. Therefore, the CFA results provide considerable evidence to support the validity of this 10-item EL measurement model with the three–factor structure. More importantly, the CFA results have demonstrated the substantive and empirical superiority of this 10-item three–factor EL measuring instrument and hence support its conceptual utility in the context of this empirical study.

Construct validity and reliability estimates for the three-factor EL measurement model

Construct	Variable	Standardized Factor Loading	S.E.	*t*-value	R^2
AK	(1). ak6Y19	0.986	0.040	24.886	0.973
	(2). ak7Y20	0.833	0.060	13.809	0.695
	(3). ak9Y22	0.868	0.044	19.755	0.753
	(4). ak10Y23	0.721	0.052	13.879	0.520
		AVE = 0.73			CR = 0.92
EW	(5). ew11Y34	0.483	0.093	5.201	0.234
	(6). ew12Y35	0.553	0.093	5.976	0.306
	(7). ew24Y38	0.525	0.091	5.801	0.276
		AVE = 0.27			CR = 0.53
PA	(8). pa14Y25	0.784	0.050	15.831	0.615
	(9). pa15Y26	0.873	0.051	17.198	0.762
	(10). pa16Y27	0.387	0.067	5.803	0.150
		AVE = 0.51			CR = 0.74

Factor correlation matrix (standardized) for the three-factor EL measurement model

	AK	EW	PA
AK	1.000		
EW	0.442	1.000	
PA	0.782	0.551	1.000

Table 4.13: CFA model assessment results for the three-factor EL measurement model

Note: All significant at the 0.01 level (N = 411)

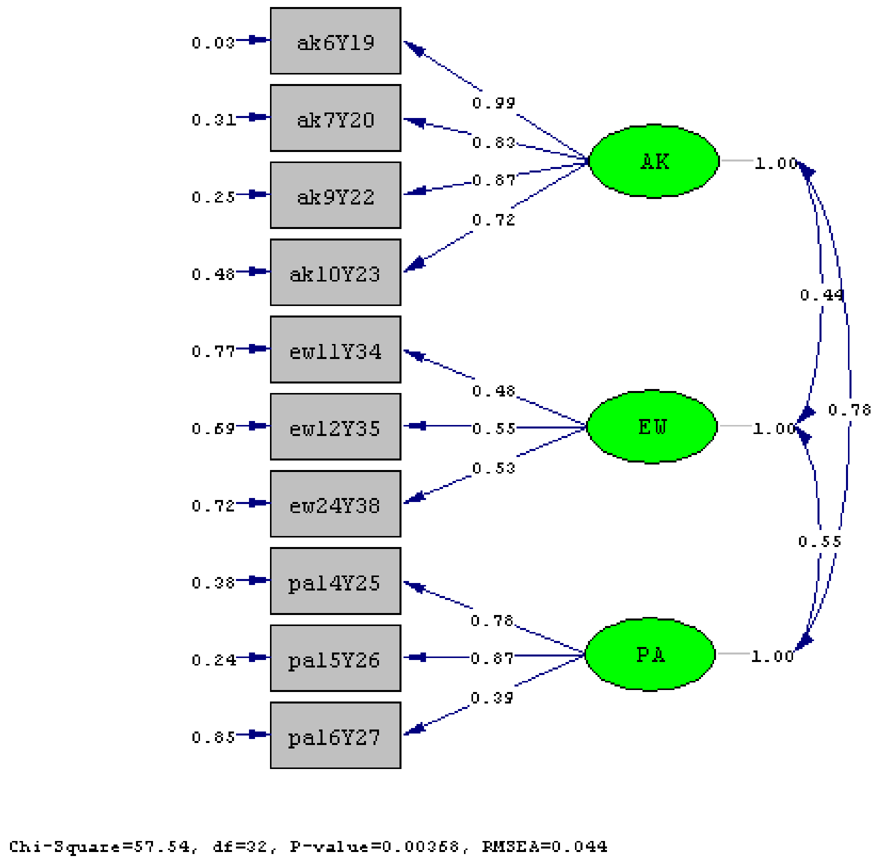

Figure 4.3: Path diagram with standardized parameter estimates for the three-factor EL model

4.7. Testing the PCLI Mediation Structural Model

In order to test the validity of the PCLI mediation structural model, I first evaluated the validity of full measurement model for the hypothesized PCLI mediation structure based on the CFA results for the three measurement models validated in Sections 4.4–4.6. Based on the CFA results in Section 4.6, the CP factor is eliminated completely from the EL measurement model. This implies that the hypotheses H4, H8 and H12 concerning the indirect effect of the PCRQ factor on the CP factor are not tested in this empirical study. Therefore, the full measurement model for the hypothesized PCLI mediation structure is specified as a 19-item six–factor standard CFA model. Correlation matrix for the full measurement model is shown in Appendix E. CFA with LISREL 8.80 was applied to test the validity of the full measurement model. The CFA results indicate that this full measurement model fits the data reasonably well: χ^2(137, N=411)=295.831 (p=0.000); χ^2/df (2.159); RMSEA (0.053) and CFI (0.982) (See Table 4.14), which suggests the acceptability of the six–factor structure for this full measurement model.

Table 4.15 summarizes the CFA assessment results for the full measurement model. All standardized factor loadings are statistically significant (p<0.01), which provide initial evidence of convergent validity. All the standardized factor loadings exceed 0.70 and all item reliabilities (R^2) exceed 0.50 (except for items: ipcY6a, ew12Y35, ew24Y38 and pa16Y27). As explained in Sections 4.5 and 4.6, these items are retained to support the content validity of the measurement models. Seven factor correlations among the constructs IPCLI; FPCLI; AK; EW and PA are statistically significant (p<0.01) as theoretically expected. Although two negative factor correlations (IPCLI $\leftrightarrow$ EW and FPCLI $\leftrightarrow$ EW) are inconsistent with prediction, it should not be a major concern. Since there are no cross-loadings and correlated errors, it provides further evidence to support discriminant validity of the full measurement model. In sum, the CFA results provide considerable evidence to support the validity of the full measurement model for the purpose of testing and evaluation of the hypothesized PCLI mediation structural model.

SEM with LISREL 8.80 was applied to evaluate the hypothesized PCLI mediation structure with the validated full measurement model. The LISREL syntax and LSIREL output files are shown in Appendix E. The six–factor PCLI mediation structural model fits the data adequately well: χ^2(144, N=411)=494.260 (p=0.000); χ^2/df (3.432); RMSEA

(0.077) and CFI (0.961) (See Table 4.14). The substantial increase in χ^2 value $\Delta\chi^2(7)=198.429$ ($p<0.01$) between the full measurement model and the structural model indicates the possibility of further model fit improvement by adding additional meaningful structural relationships (*if any*) in the structural model. Examination of standardized residuals and modification indices does suggest that additions of several structural relationships such as FPCLI→IPCLI; PA→IPCLI; and AK→PA etc. might substantially improve the overall model fit for the PCLI mediation structural model. However, the additions of these structural relationships are not substantively supported by any strong theoretical basis that can justify their inclusion in the structural model. The path diagram for the six–factor PCLI mediation structural model with the standardized parameter estimates and their corresponding *t*-values is shown in Figure 4.4.

Model	χ^2	*df*	*p*-value	χ^2/df	RMSEA	CFI
6-Factor Standard CFA Model:	295.831	137	0.000	2.159	0.053	0.982
6-Factor PCLI Mediation Structural Model:	494.260	144	0.000	3.432	0.077	0.961

Table 4.14: Goodness-of-Fit statistics for the six-factor PCLI mediation model

Table 4.16 summarizes the structural parameter estimates of all direct effects for the PCLI mediation structural model together with their estimated standard errors (SE) and confidence intervals[25] (CI). It is evident that the IPCLI and FPCLI factors affect positively the AK factor [IPCLI→AK: $\beta_{31}=0.881$ ($p<0.01$); FPCLI→AK: $\beta_{32}=0.354$ ($p<0.01$)]; the EW factor [IPCLI→EW: $\beta_{41}=0.298$ ($p<0.01$); FPCLI→EW: $\beta_{42}=0.221$ ($p<0.01$)]; and the PA factor [IPCLI→PA: $\beta_{51}=0.659$ ($p<0.01$); FPCLI→PA: $\beta_{52}=0.461$ ($p<0.01$)]. All these six direct effects are statistically significant, which are consistent with theoretical expectations. The associated larger standardized parameter estimates for the direct effects of IPCLI factor on AK, EW and PA factors indicate its relatively larger effect sizes as compared with those of the FPCLI factor. The direct effects of PCRQ on IPCLI and FPCLI are statistically significant but in negative direction [(PCRQ→IPCLI: $\gamma_{11}=-0.109$

[25] The Confidence Interval (CI) is constructed for each of the parameter estimates based on the Standard Error (SE). The 100(1-α)% CI for a parameter estimate is calculated by the formula: $\theta \pm z_{(1-\alpha/2)} \times SE(\theta)$, where θ and $SE(\theta)$ are the *parameter estimate* and its estimated *standard error*, $z_{(1-\alpha/2)}$ is the (1-α)th percentile of the standard normal score. Thus, the 95% CI on a parameter estimate is $\theta \pm 1.96 \times SE(\theta)$.

(p<0.05); PCRQ$\rightarrow$FPCLI: γ_{21}=-0.224 (p<0.01)]. The standardized parameter estimates (-0.109 and -0.224) indicate relatively small effect sizes.

In the hypothesized PCLI mediation structural model, there are three total indirect effects of the PCRQ factor on the three AK, EW and PA factors through the two mediators IPCLI and FPCLI. All these three standardized total indirect effects are statistically significant: (1) PCRQ$\Rightarrow$AK: $\gamma_{11}\beta_{31}+\gamma_{21}\beta_{32}$=-0.175 ($p$<0.01); (2) PCRQ$\Rightarrow$EW: $\gamma_{11}\beta_{41}+\gamma_{21}\beta_{42}$=-0.082 ($p$<0.01); and (3) PCRQ$\Rightarrow$PA: $\gamma_{11}\beta_{51}+\gamma_{21}\beta_{52}$=-0.175 ($p$<0.01). Table 4.17 summarizes the estimates of all the three standardized total indirect effects with their estimated SEs and CIs.

Each total indirect effect can be further decomposed into two specific indirect effects through the two mediators IPCLI and FPCLI. Thus, there are all together six specific indirect effects in the hypothesized PCLI mediation structure, which represent the substantive research hypotheses being investigated in this empirical study. LISREL 8.80 for Windows provides a function to create additional parameters (AP: Joreskog & Sorbom, 2006) for using latent phantom[26] variables to estimate the standardized specific indirect effects with their corresponding estimated SEs (See Appendix E for details). All the six standardized specific indirect effects are statistically significant. Table 4.18 summarizes the estimates of all these six standardized specific indirect effects with their estimated SEs and CIs. These empirical results support the mediation hypotheses H1, H2, H3, H5, H6 and H7 that the effects of PCRQ on AK, EW and PA are completely mediated through the two mediators IPCLI and FPCLI. However, these complete mediation effects are in negative direction and their effect sizes range from -0.032 to -0.103. Overall, 91.6% of the total variance in AK (R^2=0.916), 14.1% of the total variance in EW (R^2=0.141), and 66.1% of the total variance in PA (R^2=0.661) are explained in the PCLI mediation structural model.

[26] A phantom variable is a latent variable with zero variance and hence it does not contribute to the model fit, the implied covariance matrix and the parameter estimates (Raykov & Shrout (2002) in Cheung, 2007).

Construct validity and reliability estimates for the full measurement model for PCLI model

Construct	Variable	Standardized Factor Loading	SE	*t*-value	R^2
PCRQ	(1). pcr17X2	0.721	0.030	23.760	0.519
	(2). pcr19X4	0.874	0.027	32.502	0.764
	(3). pcr20X5	0.977	0.014	69.483	0.954
	(4). pcr21X6	0.972	0.013	72.022	0.945
IPCLI	(5). ipcY6a	0.414	0.045	9.226	0.171
	(6). ipcY7a	0.879	0.070	12.543	0.764
FPCLI	(7). fpcY11a	0.881	0.020	43.349	0.776
	(8). fpcY12a	0.809	0.024	33.451	0.654
	(9). fpcY13a	0.812	0.025	32.207	0.659
AK	(10). ak6Y19	0.921	0.029	31.377	0.849
	(11). ak7Y20	0.886	0.042	21.116	0.785
	(12). ak9Y22	0.894	0.033	26.947	0.799
	(13). ak10Y23	0.770	0.039	19.695	0.593
EW	(14). ew11Y34	0.990	0.235	4.220	0.981
	(15). ew12Y35	0.226	0.071	3.171	0.051
	(16). ew24Y38	0.239	0.075	3.184	0.057
PA	(17). pa14Y25	0.846	0.041	20.429	0.716
	(18). pa15Y26	0.889	0.039	22.883	0.791
	(19). pa16Y27	0.299	0.053	5.619	0.090

Factor correlation matrix for the full measurement model for PCLI model

	PCRQ	IPCLI	FPCLI	AK	EW	PA
PCRQ	1.000					
IPCLI	0.039	1.000				
FPCLI	-0.097*	0.558*	1.000			
AK	-0.239*	0.411*	0.358*	1.000		
EW	0.055	-0.076	-0.005	0.280*	1.000	
PA	-0.233*	0.297*	0.388*	0.749*	0.139	1.000

Table 4.15: CFA assessment results for the full measurement model for PCLI mediation model

Note: * significant at the 0.05 level (N = 411)

Direct Effect	Parameter	Standardized Estimate	SE	t-value	95% CI	
					Lower	Upper
PCRQ→IPCLI	γ_{11}	-0.109	0.043	-2.554	-0.193	-0.025
PCRQ→FPCLI	γ_{21}	-0.224	0.042	-5.294	-0.306	-0.142
IPCLI→AK	β_{31}	0.881	0.113	7.821	0.660	1.102
IPCLI→EW	β_{41}	0.298	0.081	3.698	0.139	0.457
IPCLI→PA	β_{51}	0.659	0.086	7.640	0.490	0.828
FPCLI→AK	β_{32}	0.354	0.047	7.525	0.262	0.446
FPCLI→EW	β_{42}	0.221	0.067	3.314	0.090	0.352
FPCLI→PA	β_{52}	0.461	0.048	9.666	0.367	0.555

Table 4.16: Structural parameter estimates for the PCLI mediation model

Total Indirect Effect	Parameter	Standardized Estimate	SE	t-value	95% CI	
					Lower	Upper
PCRQ⇒ AK	$\gamma_{11}\beta_{31} + \gamma_{21}\beta_{32}$	-0.175	0.037	-4.781	-0.248	-0.102
PCRQ⇒EW	$\gamma_{11}\beta_{41} + \gamma_{21}\beta_{42}$	-0.082	0.023	-3.529	-0.127	-0.037
PCRQ⇒PA	$\gamma_{11}\beta_{51} + \gamma_{21}\beta_{52}$	-0.175	0.033	-5.243	-0.240	-0.110

Table 4.17: Total indirect effects for the PCLI mediation model

Specific Indirect Effect	Parameter	Standardized Estimate	SE	t-value	95% CI	
					Lower	Upper
H1: PCRQ→IPCLI→AK	$\gamma_{11}\beta_{31}$	-0.096	0.037	-2.587	-0.169	-0.023
H5: PCRQ→FPCLI→AK	$\gamma_{21}\beta_{32}$	-0.079	0.018	-4.335	-0.114	-0.044
H2: PCRQ→IPCLI→EW	$\gamma_{11}\beta_{41}$	-0.032	0.015	-2.116	-0.061	-0.003
H6: PCRQ→FPCLI→EW	$\gamma_{21}\beta_{42}$	-0.049	0.018	-2.748	-0.084	-0.014
H3: PCRQ→IPCLI→PA	$\gamma_{11}\beta_{51}$	-0.072	0.030	-2.408	-0.131	-0.013
H7: PCRQ→FPCLI→PA	$\gamma_{21}\beta_{52}$	-0.103	0.022	-4.642	-0.146	-0.060

Table 4.18: Specific indirect effects for the PCLI mediation model

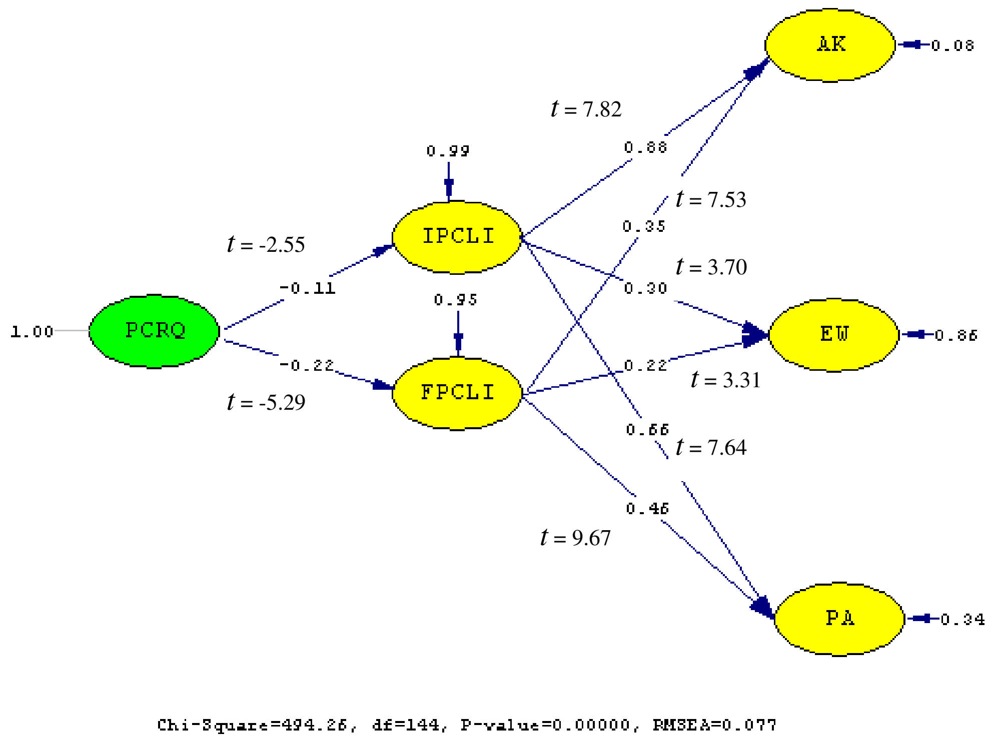

Figure 4.4: Path diagram with standardized parameter estimates for the PCLI Mediation Model

4.8. Testing the HLR Mediation Structural Model

Consider the HLR measuring instrument. The HLR construct is measured by the three specific items: hlrY1a, hlrY2a and hlrY3a. However, the item hlrY1a refers to English non-print material that is conceptually very different from the other two HLR items hlrY2a and hlrY3a, which refer to English print materials. As such, the item hlrY1a is further excluded from the confirmatory factor analysis. Since this applied HLR measurement model consists of only two items, it is an under-identified CFA model (i.e. $df<0$) and hence it is tested with the other factors in the HLR mediation structural model. As a result, the full measurement model for the hypothesized HLR mediation structure is specified as a 16-item five–factor standard CFA model. Correlation matrix for this full measurement model is shown in Appendix F. CFA with LISREL 8.80 was applied to test and evaluate the validity of this full measurement model for the hypothesized HLR mediation structure. CFA results indicate that this full measurement model fits the data reasonably well: $\chi^2(94, N=411)=151.209$ (p=0.000); χ^2/df (1.609); RMSEA (0.039) and CFI (0.990) (See Table 4.19), which suggests the acceptability of the five-factor structure of the full measurement model.

Table 4.20 summarizes the CFA assessment results for this full measurement model. All the standardized factor loadings are statistically significant ($p<0.01$), which provide initial evidence of convergent validity. All the standardized factor loadings exceed 0.70 and all item reliabilities (R^2) exceed 0.50 (except for items: hlrY2a, hlrY3a, ew11Y34, ew12Y35, ew24Y38 and pa16Y27). For the HLR construct, the two HLR items hlrY2a (λ_y=0.646; t=9.042); hlrY3a (λ_y=0.510; t=8.319) have lower standardized factor loadings than preferred. However, they are statistically significant with high t-values. As explained in Section 4.6 for the EL measurement model, the three EW items and item pa16Y27 are retained here to support the content validity of the EL measurement model. As expected theoretically, the six factor correlations among the constructs HLR; AK; EW and PA are statistically significant ($p<0.01$). Since there are no cross-loadings and correlated errors, it provides further evidence to support discriminant validity of the full measurement model. In sum, the CFA results provide considerable evidence to support the validity of the full measurement model for the purpose of further testing and evaluation of the hypothesized HLR mediation structural model.

SEM with LISREL 8.80 was applied to test and evaluate the hypothesized HLR mediation structure with the validated full measurement model. The LISREL syntax and LISREL output files are shown in Appendix F. The five–factor HLR mediation structural model fits the data reasonably well: χ^2(100, N=411)=194.943 (p=0.000); χ^2/df (1.949); RMSEA (0.048) and CFI (0.984) (See Table 4.19). The increase in χ^2 between the full measurement model and the structural model is only 43.734 with six degree of freedom (p<0.01). Further examination of the standardized residuals and modification indices does not indicate any additional structural relationships that can lead to substantial improvement in model fit and at the same time be supported theoretically. The path diagram for the five–factor HLR mediation structural model with the standardized parameter estimates and their corresponding t-values is shown in Figure 4.5.

Model	χ^2	df	p-value	χ^2/df	RMSEA	CFI
5-Factor Standard CFA Model:	151.209	94	0.000	1.609	0.039	0.990
5-Factor HLR Mediation Structural Model:	194.943	100	0.000	1.949	0.048	0.984

Table 4.19: Goodness-of-Fit statistics for the five-factor HLR mediation model

Table 4.21 summarizes the structural parameter estimates of all direct effects for the HLR mediation structural model together with their estimated SEs and CIs. It is evident that the HLR factor affect positively the AK factor [HLR→AK: β_{21}=0.826 (p<0.01)]; the EW factor [HLR→EW: β_{31}=0.596 (p<0.01)]; and the PA factor [HLR→PA: β_{41}=0.864 p<0.01)]. All these three direct effects are statistically significant, which are consistent with theoretical expectations. The standardized parameter estimates indicate relatively large effect sizes. Overall, 68.2% of the total variance in AK (R^2=0.682), 35.5% of the total variance in EW (R^2=0.355), and 74.7% of the total variance in PA (R^2=0.747) are explained by the HLR factor. However, the direct effect of PCRQ factor on HLR factor [PCRQ→HLR: γ_{11}=-0.094 SE=0.050)] is not statistically significant and is in negative direction.

In the hypothesized HLR mediation structural model, there are three indirect effects of the PCRQ factor on the three AK, EW and PA factors through the mediator HLR. Table 4.22 summarizes the estimates of all the standardized indirect effects with their estimated SEs and CIs. All these three standardized indirect effects are not statistically significant and in negative directions. In other words, these empirical results do not support the mediation hypotheses H9, H10 and H11. Thus, the effects of PCRQ factor on AK, EW and PA factors are not mediated through the HLR factor.

Construct validity and reliability estimates for the full measurement model for HLR model

Construct	Variable	Standardized Factor Loading	SE	*t*-value	R^2
PCRQ	(1). pcr17X2	0.715	0.033	21.946	0.511
	(2). pcr19X4	0.876	0.028	31.447	0.768
	(3). pcr20X5	0.946	0.016	59.599	0.894
	(4). pcr21X6	0.988	0.014	69.174	0.976
HLR	(5). hlrY2a	0.646	0.071	9.042	0.418
	(6). hlrY3a	0.510	0.061	8.319	0.260
AK	(7). ak6Y19	0.959	0.034	28.519	0.919
	(8). ak7Y20	0.809	0.054	14.906	0.654
	(9). ak9Y22	0.907	0.039	23.346	0.822
	(10). ak10Y23	0.730	0.046	15.866	0.533
EW	(11). ew11Y34	0.542	0.076	7.107	0.294
	(12). ew12Y35	0.590	0.075	7.892	0.348
	(13). ew24Y38	0.494	0.071	6.954	0.244
PA	(14). pa14Y25	0.813	0.044	18.363	0.660
	(15). pa15Y26	0.891	0.042	21.429	0.793
	(16). pa16Y27	0.381	0.060	6.336	0.145

Factor correlation matrix for the full measurement model for HLR mediation model

	PCRQ	HLR	AK	EW	PA
PCRQ	1.000				
HLR	0.114	1.000			
AK	-0.187*	0.448*	1.000		
EW	0.132	0.409*	0.416*	1.000	
PA	-0.149*	0.375*	0.723*	0.565*	1.000

Table 4.20: CFA assessment results for the full measurement model of HLR mediation model

Note: * significant at the 0.05 level (N = 411)

Direct Effect	Parameter	Standardized Estimate	SE	t-value	95% CI	
					Lower	Upper
PCRQ→HLR	γ_{11}	-0.094	0.050	-1.903	-0.192	0.004
HLR→AK	β_{21}	0.826	0.103	7.987	0.624	1.028
HLR→EW	β_{31}	0.596	0.138	4.305	0.326	0.866
HLR→PA	β_{41}	0.864	0.108	7.977	0.652	1.076

Table 4.21: Structural parameter estimates for the HLR mediation model

Indirect Effect	Parameter	Standardized Estimate	SE	t-value	95% CI	
					Lower	Upper
H9: PCRQ→HLR→AK	$\gamma_{11}\beta_{21}$	-0.078	0.041	-1.925	-0.158	0.002
H10: PCRQ→HLR→EW	$\gamma_{11}\beta_{31}$	-0.056	0.033	-1.725	-0.121	0.009
H11: PCRQ→HLR→PA	$\gamma_{11}\beta_{41}$	-0.082	0.043	-1.891	-0.166	0.002

Table 4.22: Indirect effects for the HLR mediation model

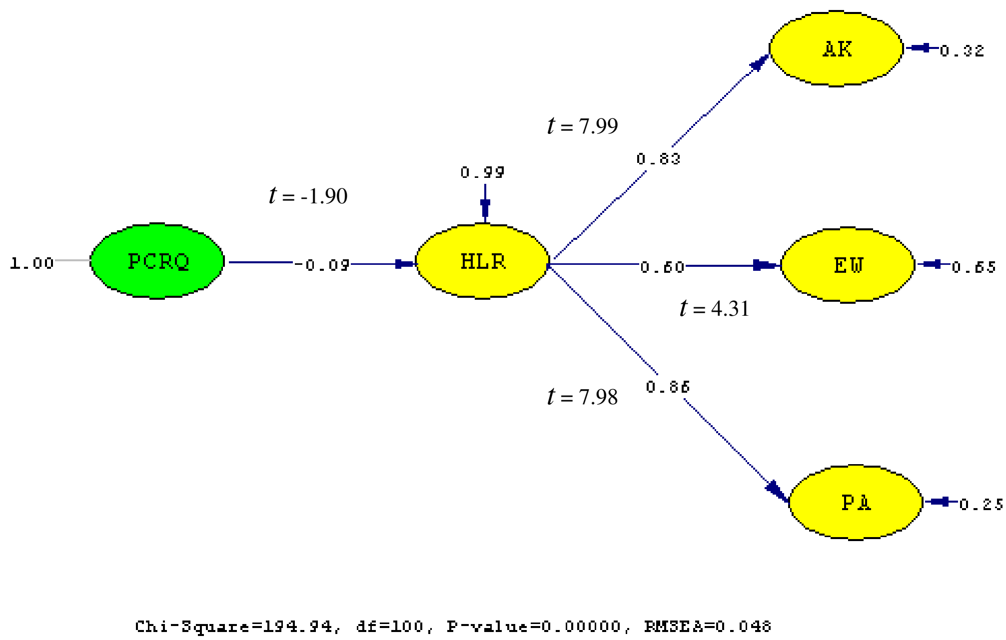

Figure 4.5: Path diagram with standardized parameter estimates for the HLR Mediation Model

Chapter 5: Discussions and Conclusion

5.1. The Parent-Child Literacy Mediation Theory

The goal of this research study is threefold: (1) to develop conceptually the theoretical framework for the development of children's emergent literacy; (2) to test empirically the validity of the parent-child literacy mediation theory developed; and (3) to translate the empirical findings into appropriate advice and guidance for parents, policymakers, researchers, and others involved in facilitating the development of children's emergent literacy. My main emphasis has been on home and family variables that are associated with children's emergent literacy development, especially on the role of parent-child relationship and home literacy environment, and thereby provide an integrated picture about the developmental process of children's emergent literacy and how this developmental process can be enhanced for preschool children at home.

As reviewed in the literature, to understand the underlying mechanism through which the quality of parent-child relationship affects the developmental process of children's emergent literacy, one must account for the crucial mediation structure in conceptualizing the connections between the parent-child relationship quality and the different early children's literacy-related factors at home. Therefore, in articulating the theoretical-conceptual model, I have focused my lens exclusively on the intervening processes that occur within the home literacy environment created by parents for the development of children's emergent literacy. It has been argued that the influences of the parent-child relationship quality on children's emergent literacy development are indirect rather than direct and it is posited as the hypothetical mediation structure, where the different facets of home literacy environment mediate the effects of parent-child relationship quality on children's emergent literacy development. In other words, it is important to take into account the indirect effects of the parent-child relationship quality on children's emergent literacy development.

In the meanwhile, it is paramount, first of all, to acknowledge the beneficial positive direct effects of the different facets of home literacy environment, and hence demonstrate its mediating role, in the development of children's emergent literacy.

5.2. Home Literacy Environment and Children's Emergent Literacy

The findings from this present research study concerning the relations between home literacy environment and children's emergent literacy outcomes are consistent with those in previous home literacy research. The variations in home literacy environment would affect directly and positively the children's emergent literacy development. In other words, improving the different facets of home literacy environment will directly enhance children's emergent literacy development. The setting of this present research had provided an even stronger test for this causal linkage than previous home literacy research because formal English language instruction only begins in Grade 1 in elementary school and English is not the dominant daily language in the community of Hong Kong. As such, the preschool children's emergent literacy development in this sample is much less likely to be influenced by the school and community than in the typical samples where English is either children's first language or their community language. Moreover, these results add five additional contributions to the emergent literacy research literature.

First, the present research study clearly demonstrated that the differential effects of the different facets comprised in home literacy environment on the different domains of children's emergent literacy were robust. The home literacy resource and the two components of parent-child literacy interaction would affect differentially the different domains of children's emergent literacy (i.e. alphabet knowledge, emergent writing and phonological awareness). Thus, it supported the notion that researchers should disentangle the influences from the different dimensions of any multidimensional constructs, as far as possible, in all future home literacy research rather than using a single composite index that overlaps the different dimensions of specific construct as practiced in most empirical home literacy research studies, which may ultimately attenuate the effect size of one variable on another. However, it does not imply that one cannot use composite indices for multidimensional constructs in multiple regression analysis in empirical studies. Indeed, because of certain limitations (e.g. insufficient sample size) in some empirical studies, it might be adequate to use composite indices. More importantly, it is noted that one should be prudent when interpreting findings that are based on the composite indices involved in traditional multiple regression for analyzing variables to avoid misinterpretations.

Second, the present research study provided stronger evidence to support the positive direct effect of home literacy environment on children's emergent literacy development than those had been provided by previous home literacy research. The effect sizes of informal parent-child literacy interaction, formal parent-child literacy interaction and home literacy resource on the different specific domains of children emergent literacy (i.e. alphabet knowledge, emergent writing and phonological awareness) ranged from 0.298 to 0.881, from 0.221 to 0.461, and from 0.596 to 0.864 respectively and they were substantially larger than those found in most previous empirical studies. The use of structural equation modeling approach proved fruitful because of its ability to estimate simultaneously all the hypothesized dependent relationships and its ability to take measurement errors into account. It had improved not only the statistical power of effect detection, but also the accuracy of statistical estimation of the hypothesized structural relationships between the theoretical constructs.

Third, the informal parent-child literacy interaction and home literacy resource, in this present research study, appeared to be more robust predictors of the specific domains of children's emergent literacy development than the formal parent-child literacy interaction as evidenced by the pattern of their relatively larger effect sizes, which in turn, contributed to the larger total amount of variances explained in the specific domains of children's emergent literacy: alphabet knowledge, emergent writing and phonological awareness. Interestingly, however, this finding is not in line with those recent research results on formal parent-child literacy interaction that parents can be more effective teachers for their young children (Senechal & Young, 2008; and Senechal & LeFevre, 2014). Further examination of the data in terms of the factor correlations between the parent-child relationship quality and the two components of parent-child literacy interaction showed that parents were less likely to teach directly their children than to have shared storybook reading with their children. Coupled with this less likelihood of direct parent-teaching in literacy interactions with their children at home, it is perfectly plausible that most parents in Hong Kong might be lacking in the knowledge of how to properly teach their preschool children directly on English literacy, and hence it could explain the discrepancy between the results of the research studies. Nevertheless, it is important to note that the positive factor correlation (ϕ=0.114; t=1.619), though it is not statistically significant, between the parent-child relationship quality and home literacy resource does indicate the potential opportunities for the parents with better parent-child relationship quality to create an optimal home literacy environment through providing their preschool children with adequate home literacy resource, which in turn, can further enhance their young children's emergent literacy development.

Fourth, this present research had also clearly demonstrated that the two components of parent-child literacy interaction were dependent on one another as evidenced by the robust positive factor correlation (ϕ=0.558; t=9.499) between the informal parent-child literacy interaction and formal parent-child literacy interaction. In other words, parents, who had more frequent informal parent-child literacy interaction with their children, also had more frequent formal parent-child literacy interaction with their children or vice versa. This added an additional piece of evidence to the research literature, which supported the idea that the two components of parent-child literacy interaction should be interdependent rather than independent. However, whether it was the informal that preceded the formal parent-child literacy interaction was not clear. Future research that looks into this interdependent relationship in terms of the causal direction is important for the design of possible intervention programmes. If it could be proved that the informal parent-child literacy interaction preceded the formal parent-child literacy interaction, it might be more effective for the possible intervention programmes to focus more on the informal parent-child literacy interaction for parents.

Fifth, this present research study expanded the previous home literacy research on children's emergent literacy development to further include samples of preschool-aged children from Asian countries and regions. Over the past few decades, home literacy research studies have been conducted for family samples mostly from the Western countries and regions using primarily English alphabetic writing system. To my knowledge, this is the first home literacy research study conducted to-date for a sample of preschool-age children with mostly Chinese ethnicity (63%) learning English as their second language in Hong Kong. Thus, the present empirical findings had provided further support to the generalizability of positive direct effects of the home literacy environment in English on children's emergent literacy development to the more diverse linguistic and ethnic backgrounds beyond the Western countries and regions. All these results are consistent with the well-established idea about what parents can do at home for enhancing their preschool children's English literacy development.

5.3. Parent-Child Relationship and Children's Emergent Literacy

The findings in this research study supported the hypotheses that informal parent-child literacy interaction and formal parent-child literacy interaction significantly mediated the relations between the parent-child relationship quality and children's emergent literacy development. However, the mediation hypotheses with home literacy resource as the mediator were rejected. In other words, the quality of parent-child relationship exerts its influences on children's emergent literacy development mainly through the informal and formal parent-child literacy interactions rather than the home literacy resource. Nevertheless, it should be noted that the finding about home literacy resource that it does not transmit the effect of parent-child relationship quality on children's emergent literacy development is basically consistent with the previous home literacy research literature, which generally acknowledges that children's literacy experiences with home literacy resource available are primarily initiated by children themselves freely and independently through their own explorations and observations at home. Given that the home literacy resource as one of the strong predictors of children's emergent literacy development is a well-established both theoretically and empirically, the main implication for *all* parents is that they should recognize the importance of providing their young children with adequate home literacy resource in their home environment for promoting their children's emergent literacy development.

The informal and formal parent-child literacy interactions are the only categories of children's literacy experiences that involve *simultaneously* both parents and children. Logically, it is expected, that the impact of parent-child relationship quality on children's emergent literacy should be positive. However, paradoxically, what is surprising in this empirical study is that the indirect effects of parent-child relationship quality on children's emergent literacy development were in negative direction. More specifically, while both the informal and formal parent-child literacy interactions had positive direct effects on the specific domains of children's emergent literacy (i.e. significant β_s range from 0.221 to 0.881), the negative direct effects of parent-child relationship quality on both the informal parent-child literacy interaction (γ_{11} = -0.109; p<0.05) and formal parent-child literacy interaction (γ_{21} = -0.224; p<0.01) were indeed an unexpected result. As a consequence, the parent-child relationship quality showed significant negative specific indirect effects on the specific domains of children's emergent literacy through the two important mediators. In other words, the parents with a higher level of parent-child relationship quality have less frequent parent-child literacy interaction with their preschool children at home than those parents with a relatively lower level parent-child relationship quality. This is quite alarming although the effect sizes of these negative specific indirect effects are relatively small or may be negligible (i.e. significant $\gamma\beta_s$ range from -0.103 to -0.032). More importantly, it does imply that parents with a higher level of parent-child relationship quality have failed to capitalize on their favorable position to optimize their potential significant positive impacts on children's emergent literacy development during this critical preschool period. Whether this reflected that the parent-child literacy mediation structure for the development of children's emergent literacy had been undermined by other underlying mechanisms operating in the particular socio-cultural milieus of Hong Kong is yet to be further examined empirically. However, why this is the case? How can such negative indirect effects be explained?

One might argue that the *ceiling* effect of the PCRQ observed variables had produced these "*odd negative links*" in the model and hence "*the finding is an artifact*". While the potential threat of this ceiling effect is recognized that it leads to violation of multivariate normality assumption for the variables involved in data analysis (Hessling et al., 2004), this claim might be correct *when* all the observed (ordinal) variables in the theoretical model had been inappropriately treated *as if* they were continuous variables and were analyzed by applying normal-theory estimators (e.g. ML estimation method) based on product-moment correlations in SEM. As discussed thoroughly and explained in detail in Section 4.2 and 4.3, the ADF approach was applied to purposely address the problems encountered in analyzing the ordinal variables (incl. existence of floor or ceiling effects). Given the large sample size and that the assumption of *bivariate normality* for each pair of the underlying latent response variables in each measurement model was thoroughly satisfied in this empirical research study, the application of the WLS estimation method based on polychoric correlations for analyzing the observed (ordinal) variables can be appropriately expected to practically produce asymptotically unbiased and consistent parameter estimates, correct standard errors and model fit statistics. On the other hand, it might be noteworthy to point out two important considerations concerning the PCRQ measure in this empirical research study: (1) the PCRQ measure was administrated to the sample that reflects the more socially homogeneous population of the middle-class families with relatively well-educated parents and higher household income in Hong

Kong and hence the narrow score variance in the PCRQ variables (See Section 3.1 and Table 4.3); and (2) PCRQ is the exogenous (*not* endogenous) latent variable in the theoretical model. As a consequence, these suggest that the *statistical significance* of the negative specific indirect effects (though with small effect sizes) under the condition of narrow score variance in the PCRQ variables might possibility indicate the *practical significance* of the role of parent-child relationship quality in children's emergent literacy development.

It seems plausible that a recent growing phenomenon of private tutoring might have been playing a part in altering the potential positive direction of the hypothesized mediation effects in this present research study and hence offer researchers certain useful lines of enquiry. Private tutoring can be narrowly defined as a fee-based tutoring that provides supplementary instruction to children in any academic subjects they study in the mainstream education system (either public or private). It has also been named as the "shadow education" in literature and it has different modes of operations in different cultural contexts. Usually, private tutors can be registered teachers or retired teachers, university students or university professors, and other community members. As noted in literature, this recent globalized phenomenon of private tutoring was described by Dang and Rogers (2008: p161) as the emerging "*third important education sector: the private tutoring industry*" in the 21st century and it has been attracting some authors' or researchers' attentions from various countries and regions in both the West and the East (Bray & Kwok, 2003; Kwok, 2004; Dang & Rogers, 2008; Lee et al., 2009; Ventura & Jang, 2010; Ireson & Rushforth, 2011 and 2014). In the socio-cultural context of Hong Kong, private tutoring can be broad enough to cover the fee-based tutoring through either privately-run nursery/playgroup programmes for preschool children or a one-to-one tutoring setting held in a child's home (or in a private tutoring center). In recent years, privately-run nursery/playgroup centers that offer classes for preschool children have become ubiquitous in the society of Hong Kong and the local government is now facing the challenges on how to regulate such establishments in terms of ordinances and regulations about safety and supervision issues etc. (Lau, Lee & Rao, 2011). Furthermore, as observed in the Hong Kong universities' campuses, the number of posted advertisements with high tuition rates for employing university students as part-time one-to-one private tutors to teach preschool-aged children in various areas (e.g. English, music and art etc.) has been increasing recently. From a more micro perspective, one of the important implications of this arising phenomenon of private tutoring is that it might have offered parents with more choices to improve their children's academic achievement. More specifically, as it applies to this particular case in Hong Kong, private tutoring might be providing the parents with an alternative route to promote the development of their preschool children's emergent literacy.

As explained earlier, based on the data analysis in this present research, most parents in Hong Kong might lack adequate parental knowledge on how to teach directly their preschool children about emergent literacy, which in turn, influence their decision to teach their young children at home. Besides, most of the families in this present sample dataset (more than 56%) are two-parent dual-earner families and hence these parents might lack sufficient parental time available for creating appropriate home literacy activities with their children in their immediate home literacy settings in daily life. With the continuous growing 24/7 global economy (Presser, 2003), there has been a growing concern in work-family research about negative consequences of work-family conflicts on employees' personal life (e.g. psychological distress and mental health problems etc.), family functioning (e.g. family role performance such as emotional exhaustion due to work-family role conflicts) and childcare (e.g. working parents with long hours of non-parental childcare). Parental feelings of time deficits with their children have been widespread, especially for those two-parent dual-earner families, in industrialized countries and regions (Nomaguchi et al., 2005; and Bianchi & Milkie, 2010). As in the case of Hong Kong, Lau (2010) found the negative indirect effect of working fathers' work-family conflict on their children's well-being through its negative effect on the quality of father-child relationship and father's parenting. In a recent study of the impact of work-family interface, Lau and colleagues (2014) reported that Hong Kong working population has been experiencing an increasingly intensified over-working condition such as lengthy work hours, increasing unpaid overtime work, deteriorating work stability and work security etc. In a home literacy research study conducted recently in Canada, Martini and Senechal (2012) had also observed that the lack of parental knowledge and lack of parental time available were two important obstacles for parents in teaching their preschool children, which influenced the parents' decision to teach and the frequency of parents' direct-teaching to their young children at home respectively. A plausible consequence for the lack of parental knowledge and parental time available to directly teach preschool children, especially for those conscientious parents, is that parents might worry about their children's potential early delays in emergent literacy development. Coupled with the growing phenomenon of private tutoring, it seems very likely that many Hong Kong parents have been actively seeking to "outsource" their parental responsibility of promoting children's emergent literacy development through private tutoring.

Although both the informal and formal parent-child literacy interactions have been generally acknowledged as conventional parental practices for promoting children's emergent literacy at home, this arising private tutoring approach might be considered and employed by the parents in Hong Kong as an "effective" alternative practice to promote their children's emergent literacy development. In other words, it is plausible that private tutoring might have become another specific mediator that transmits the effects of parent-child relationship quality on children's emergent literacy development. Thus, this alternative intervening process and its potential interactions with the existing underlying mechanisms of the home literacy environment might have distorted this parent-child literacy mediation structure for children's emergent literacy development. For instance, the higher the parent-child relationship quality, the more frequent the private tutoring approach employed by the parents for promoting their children's emergent literacy development, and consequently further reducing the frequencies of both the informal and formal parent-child literacy interactions at home. Of course, it should be recognized that such processes might vary as a function of other potential influences from both inside and outside the immediate home literacy settings such as the characteristics of parents (e.g. parental values and goals; parental time and parental knowledge etc.) alongside with the contextual factors in the social community (e.g. the availability of private tutors) respectively. At present, it should be noted that the effectiveness and the impact of private tutoring approach on development of children's emergent literacy are yet to be further investigated. Since the whole picture of entire underlying mechanisms is not yet clear, this alternative private tutoring approach deserves to be examined in future home literacy research studies. However, given the significant empirical evidence that both the informal and formal parent-child literacy interactions have substantial positive direct effects on different domains of children's emergent literacy has already been well-established, it is worthy of note that parents might have falsely believed in the investment for private tutoring approach as an "appropriate" alternative route that it could effectively substitute for parental role and parental responsibility in promoting their children's emergent literacy development during this critical preschool period.

In the sociolinguistic environment of Hong Kong, parents believe that they play an important role and the preschool period is an important time for developing children's emergent literacy skills, as evidenced by the empirical dataset in this present study (See Table 3.2). In other words, parental values and goals are basically geared to developing their children's emergent literacy *outcomes* during the critical preschool period because they generally recognize that a high level of proficiency in English literacy is important for their children's life-long prospects by providing a strong foundation for their children's academic motivation and academic performance in the subsequent formal schooling. However, in the thinking about this important goal of developing children's emergent literacy, many parents' focus is, at least, too narrow as well as too limited. Worried by what they fear of the potential early delays in the development of their children's emergent literacy because of the lack of parental knowledge and parental time, parents tend to attempt firstly to look out for different ways available *outside* their immediate home literacy settings by either immersing their preschool children in the privately-run nurseries/playgroups or employing one-to-one private tutors in an effort to support the development of their children's emergent literacy. Given that a growing majority of their peer-group and neighboring parents are basically practicing the same in their social community, these alternative "external" approaches seem to be right and convincing to the parents. This is, indeed, a typical phenomenon of humanity, the so called "Herd Instinct", which primarily refers to the natural tendency in people's thinking that it will be better to be wrong in a large group of people than to be right alone. In other words, in reality, parents are often governed more by the unconscious value system (or ideology) than by their own individual conscious rational choice. But rationally, can such alternatives appropriately and effectively substitute their parental role and parental responsibility? Of course: No. These alternatives are, at most, supplementary (*if any*) in nature.

Undoubtedly, the parent-child relationship is unique among all human relationships and parents are their children's first literacy agents. During the critical preschool period, parents are the best and most effective literacy teachers for their children in their own home literacy settings. By the very *nature*, parents are inherently placed at the unique position, particularly for parents already with a high level of parent-child relationship quality, to gauge effectively their children's ZPD and hence ultimately provide their young children with optimal literacy learning experiences. In other words, a high quality level of parent-child relationship is the basis for generating high quality interactions in all home literacy activities between parents and children that are generally characterized by parents' supportive and responsive interaction style, together with children's enjoyable and active participation style in the home literacy environment. These frequent and high quality parent-child literacy interaction learning experiences are absolutely imperative for the *nurturing* of preschool children's initial motivation and continued interest for literacy, which have been well-recognized as crucial in the development of children's emergent literacy. Thus, this unique position and primary responsibility belong to parents themselves and they cannot abdicate such important tasks to others. However, if parents just stop there seeking to promote the development of their children's emergent literacy simply by "outsourcing" their critical and unique parental role and parental responsibility to others, they will inevitably miss or lose this wonderful window of opportunities to build the strong foundation necessary for their own children that has a lasting and profoundly positive effect on their children's whole selves and whole futures in their life-long prospects. Clearly, what parents really need are some science-based advice and guidance, encouragement and help to get there.

5.4. The Brain as the "Language Organ"

Scientists widely agree: if there is really a "language organ", it is probably the brain. As such, another way to best comprehend the important role of parent-child relationship in children's emergent literacy is from the scientific study of *early*[27] brain development at the molecular level, which provides a valuable perspective on the development of all aspects of child's well-being. The human brain develops over time through an ongoing and complex process of proliferation and pruning from conception to early adulthood (for a brief review of how the brain develops, see Jabes & Nelson, 2014). Decades of research and recent advances in the field of developmental neuroscience have been consistently revealing the well-established scientific evidence on two important keys for achieving healthy and optimal brain development: *timing* and *experience* (National Scientific Council on the Developing Child, 2004; 2007 and 2010; Levitt, 2014; Jabes & Nelson, 2014).

First, during the first few postnatal years of life (from birth to 5 years of age), the child's brain develops rapidly (at an amazing rate of forming 700 new synapses (or neural connections) per second) and sequentially from bottom up in a hierarchical approach with the simplest neural circuits being formed first to provide the foundation for the more complex neural circuits to emerge later in life (Levitt, 2014). In other words, every new competency is built upon the competencies that developed previously. As illustrated in Figure 5.1, the neural circuits for the basic sensory functions (i.e. vision and hearing) are the first to develop and hence prepare the infant to interact with the environment, followed by the neural circuits for early language skills development and then the neural circuits for higher cognitive functions (Nelson, 2000; and Levitt, 2014). The synaptogenesis (i.e. the wiring of the brain) for each of the different brain functions follows a different time course and peak at a different time during the first few years of life, and then followed by a gradual reduction (i.e. synaptic pruning) over the years that eventually brings the overall number of synapses down to adult levels (Nelson, 2000; Jabes & Nelson, 2014). Although different brain functions (sensory, language, cognitive and emotion etc.) mature at different time points in the development of a child's life, they

[27] While the basic brain architecture is formed during the *prenatal* period, I focus my discussion here only on the early *postnatal* period because it is particularly relevant. It is important to note that the *early postnatal* period is the time when the child's brain development can be influenced significantly by his or her *experience* and the basic brain architecture of the child will have been established by the preschool-aged period (Jabes & Nelson, 2014).

interact and communicate with each other and operate in a highly interdependent and wholly integrated fashion to achieve the proper overall functioning of the child and together they form the foundation for child's development and well-being in later life (Levitt, 2014; and Jabes & Nelson, 2014).

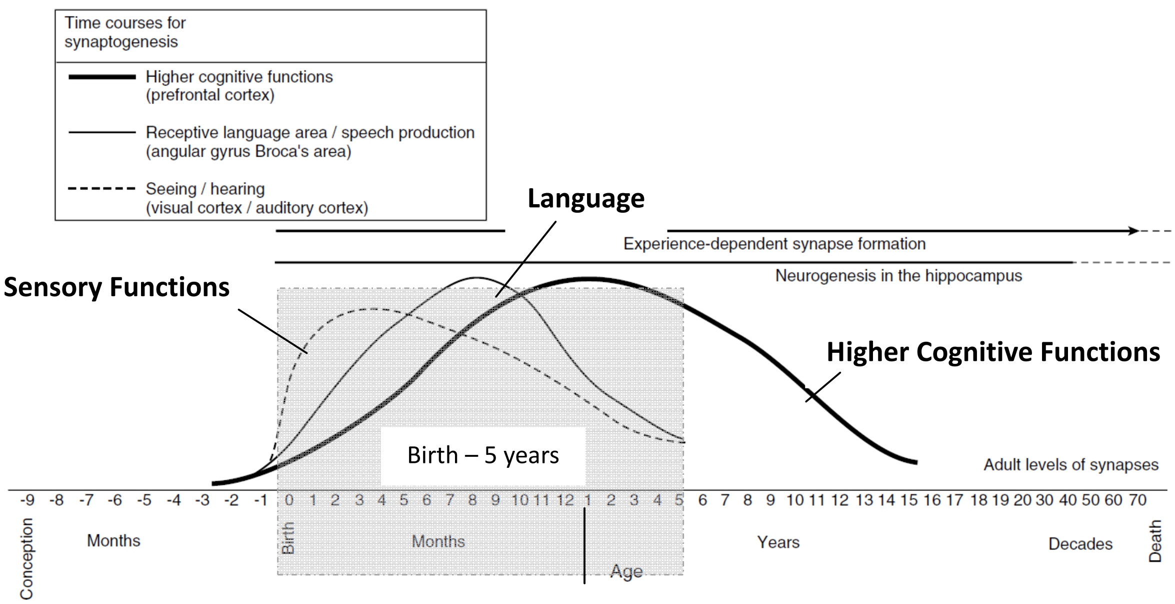

Figure 5.1: Human brain development: Time courses for synaptogenesis for different brain functions

(Source: Adapted from Charles A. Nelson, 2000)

Second, a rapidly growing body of scientific evidence has been clearly showing that the child's developing brain is profoundly influenced by *experience*, which is defined as the interactions between the child and the environment, rather than just by undergoing a purely maturational process predetermined by intrinsic genetic factors (Knudsen, 2004; Jabes & Nelson, 2014). While the *timing* is genetically predetermined, early *experience* exerts a powerful influence on the developing brain by determining whether the neural circuits in the brain are strong or weak (Levitt, 2014). During the synaptogenesis for each brain function in early brain development, the process of synaptic pruning is highly susceptible to the effects of experience by following the Hebbian principle of use and disuse (i.e. "use it or lose it"), which means that the less active synapses due to lack of use are weakened or pruned (hence a reduction in the overall quantity of synapses), while at the same time the more active synapses due to the effects of experience are strengthened and hence the neural circuits are reinforced (Jabes & Nelson, 2014). Besides, recent advances in scientific research have shown that early experiences have the power to chemically "*mark*" the genes temporarily or permanently (a process called *epigenetic modification*), which can determine or control whether and how the genes are expressed[28] with long-lasting effects on the brain and hence lifelong consequences on the child's health and well-being (for reviews of how the early experiences alter gene expression and affect child's long-term development, see the report from the National Scientific Council on the Developing Child, 2010). In other words, the developing brain is shaped by both genes and experiences (Levitt, 2014) and active use of learning and memory neural circuits in the child's brain, generated by positive early experiences, can lead to the epigenetic changes that build the foundation for more effective learning capacities in the developing brain that last a lifetime (National Scientific Council on the Developing Child, 2010).

Collectively, it is important to note that the impacts of early experiences on the developing brain operate in a time-dependent manner, which means that the extent of the effects of experience on the brain varies greatly as a function of the maturational state of the brain at the time of exposure (Jabes & Nelson, 2014). One of the most important properties of neural circuits is what scientists called "*developmental plasticity*", which refers to the abilities of different brain functions to be shaped by early experiences during development. As the child's brain develops through different stages, its sensitivity or vulnerability to the effects of experience varies with time and hence the concept of *sensitive periods,* which represents the limited periods in development during which certain brain capacities are profoundly influenced or altered by early experiences (Knudsen, 2004; Jabes & Nelson, 2014). In other words, during the sensitive periods of early brain development, the brain is most plastic (or flexible) to be significantly molded by a wide range of experiences. While the brain becomes more specialized over time (as it matures through different stages) to assume more complex brain functions, the brain's developmental plasticity declines after the sensitive periods have ended and hence it is far more difficult (or less capable) for the effects of new and different experiences to

[28] Gene expression refers to whether the genes are turned "on" or "off", which essentially means that *whether* and *when* the genes are activated to do certain tasks. While negative early experiences (e.g. repetitive and stressful experiences) can cause negative epigenetic changes that damage the brain functions, positive early experiences (e.g. rich and supportive learning experiences) can generate positive epigenetic signatures that activate genetic potential (National Scientific Council on the Developing Child, 2010).

substantially alter the stabilized brain architecture (National Scientific Council on the Developing Child, 2007). Since different brain functions pass through distinct sensitive periods at different times with the lower level neural circuits (e.g. sensory functions) develop earlier and the higher level neural circuits (e.g. language functions) mature later, different kinds of early experiences are vital at different ages for optimal brain development and hence the concept called *age-appropriate experience*, which means that experiences provided in the earliest years should be developmentally appropriate for the child's ability and developmental stage (National Scientific Council on the Developing Child, 2007). In other words, in order for the developing brain to take full advantage of its developmental plasticity, tailor-made and stimulating early experiences are necessary to optimize the development of relevant neural circuits' architecture. For example, when a parent reads a picture storybook with a toddler who is learning to speak, the parent can make use of this important opportunity to point to the pictures and talk about stories in the pictures rather than to focus on the written words because the necessary neural circuitry in the child's brain has not yet been formed (or sufficiently wired) to support the mastery of the particular skill of decoding written language that comes later. Taken together, all the scientific evidences converge to the notion that the child's developing brain is biologically prepared to be shaped significantly by age-appropriate experience during sensitive periods of development in the early postnatal years as it develops through the different developmental stages in order to achieve its optimal brain architecture for all aspects of child's functioning and well-being in the later life. Just as what Jack P. Shonkoff, the director of Center on the Developing Child at Harvard University, and his colleagues describe that the process of early child development is best understood "as a function of "*nature dancing with nurture over time*"" (Shonkoff et al., 2012: p.234).

Human language is a highly "*encrypted code*" that consists of many common basic elements (consonants, vowels and phonemes etc.) with inherent speech sound patterns, designed to enable people to communicate with each other by using the code that they learn once and hold onto for a lifetime (Kuhl, 2004 and 2010). Scientists generally agree that infants are far better language learners than adults and they learn language rapidly and effortlessly from exposure to language by following the same developmental path regardless of culture as shown in Figure 5.2, which shows the developmental changes that occur in both speech perception and speech production in typically developing human infants during their first year of life in development (Kuhl, 2004; and Kuhl et al, 2008). But, how do infants do that? Children's early language development is a classic example of "*nature dancing with nurture over time*". From the neurobiological perspective, an accumulating body of scientific evidences has been consistently revealing that the infant brain is genetically predisposed with incredible capabilities to "*crack the speech code*" at the more elementary phonetic level of language and hence acquire any or all languages with remarkable speed through exposure to the age-appropriate socially interactive linguistic experiences in the first year of life (Kuhl, 2004; 2007; 2009; 2010 and 2011; Kuhl et al., 2008; and Ramirez-Esparza et al., 2014).

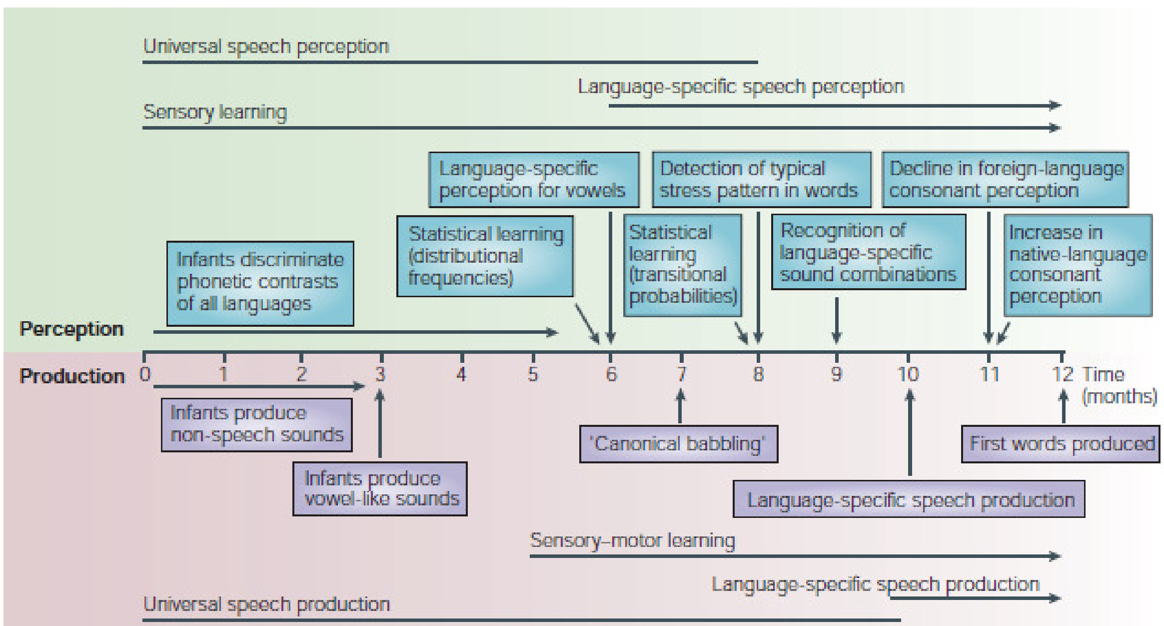

Figure 5.2: The universal language timeline of speech-perception and speech-production development (Source: Patricia K. Kuhl, 2004)

First, the infant brain is biologically prepared for early language learning with powerful computational capabilities to detect the statistical and prosodic patterns in language input that leads to phonetic learning and word learning (Saffran, 2003; Kuhl, 2004 and 2010). One of the important properties of language is that the distributional frequencies (or patterns) of speech sounds differ across languages and hence provide clues about the phonemic structure of different languages (Maye et al., 2002). Scientific evidences have consistently indicated that early infants are very sensitive to the relative distributional frequencies of phonetic segments in the language(s) they hear and the infant brain can analyze the statistical distributions of speech sounds and learn from them – a basic implicit automatic learning mechanism called "*statistical learning*" that strongly affects both phonetic learning and word learning in infants (Kuhl, 2004; 2007; and 2010). Besides, human language development is one of the classic examples of developmental plasticity that exhibits a "*critical period*"[29] for learning (Knudsen, 2004; Kuhl, 2004; 2010 and 2011; Jabes & Nelson, 2014). Figure 5.3 shows a simplified graph for competence of second language as a function of the age of second language acquisition and scientists agree consensually that this learning curve represents the findings from a wide variety of empirical studies on second language acquisition (Kuhl et al., 2008; Kuhl, 2010 and 2011). In other words, while the infant brain is most plastic at birth for acquiring one or multiple languages, this initial plasticity (or flexibility) for language acquisition decreases dramatically with age and hence reduces the capacity of the brain to acquire a new language as in adults. Different aspects of language exhibit different critical periods for learning. For instances, the critical periods for phonetic learning and syntactic learning occur prior to the end of the first year and from 18 to 36 months of age respectively (Kuhl, 2010).

[29] Critical periods are a subset of sensitive periods during which the instructive influence of experience is essential for typical brain circuit performance and the effects of experience on performance are irreversible (Knudsen, 2004).

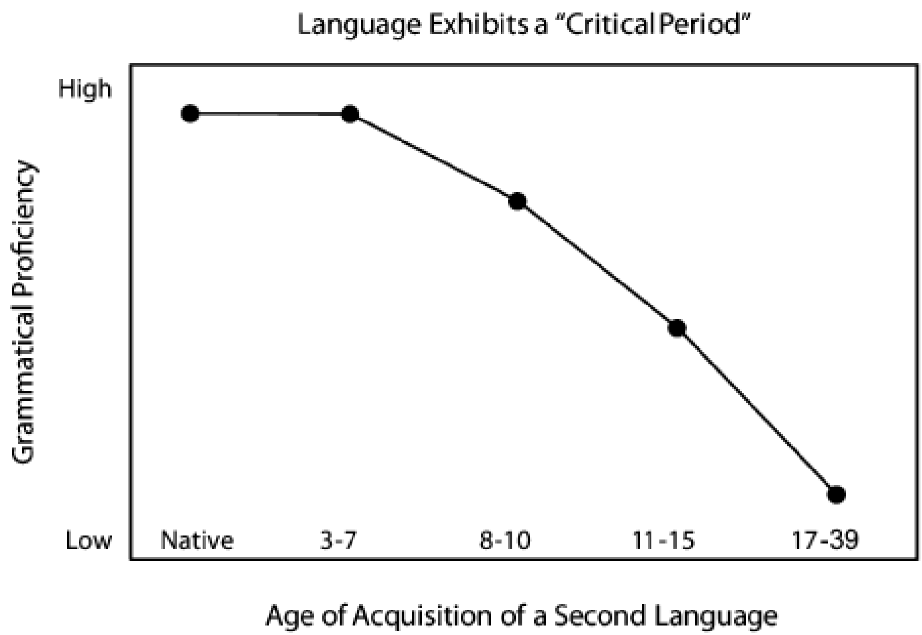

Figure 5.3: The relationship between age of acquisition of a second language and language skills
(Source: Adapted from Johnson and Newport, 1989; cited from Patricia K. Kuhl, 2010)

Second, despite infants' powerful innate computational capabilities for rapid language learning, recent advance in scientific research has shown that early language learning is severely constrained by the absence of social interaction (Kuhl, Tsao & Liu, 2003; Kuhl, 2004; 2007 and 2010). In an experimental study conducted by Kuhl et al. (2003), two groups of 9-month-old American infants were exposed to identical native Mandarin Chinese for twelve 25-minute sessions (reading books to the infants, talking about and playing with toys that showed to them) scheduled over 4-5 weeks of time: Group 1 via *live* Mandarin speakers, but Group 2 via standard television screen (or audiotape-only) presentation. A control group was also set up with similar settings but was exposed to only native English from live American speakers. After completing the scheduled sessions, all the infants were tested on a Mandarin Chinese phonetic contrast (i.e. does not occur in English). The results indicated that the Mandarin live-exposure group not only performed significantly better on Mandarin Chinese phonetic contrast (i.e. phonetic learning) than the control group that exposed to only English, but also performed equivalently well as compared with the same age Chinese infants tested in Taiwan who had listened to Mandarin in natural language-learning situations since birth. However, those infants in the Mandarin non-live (i.e. TV or audio-only) exposure group showed no evidence of phonetic learning and their performance on Mandarin Chinese phonetic contrast was equal to those infants in the control group (who heard no Mandarin at all since birth). Therefore, it is clear that infants' innate predisposition with computational capabilities is simply not sufficient enough. The presence of social interactions with *live-person* during language exposure in natural language learning situations is critically important for achieving the robustness of early language learning in young children. Besides, the significant performance in phonetic learning by the American infants in the Mandarin live-exposure group suggested that infants can learn rapidly a foreign (or second) language when first exposed to it at 9-month-old and this exposure to a new foreign language can actually *reverse* the universal decline in infants' foreign-language speech perception (Kuhl et al., 2003; Kuhl, 2004 and 2010).

In another experimental study conducted by Goldstein, King and West (2003), a group of mother-infant dyads (eight-month-old infants) was divided into two groups after a baseline period of normal mother-infant social interactions: 'contingent condition' (CC) group and 'yoked-control' condition (YC) group. During the social response period, the CC mothers were asked to respond immediately to their infants' vocalizations by smiling, moving closer to touching their infants (i.e. contingent social interactions), but the YC mothers were asked to respond to their infants based on the experimenter's instructions timed to coincide with the infants' vocalizations in the CC group (i.e. non-contingent social interactions). The results demonstrated that the infants in the CC group produced more number and more mature adult-like vocalizations (i.e. speech production) than those infants in the YC group in the social response period. In other words, contingent social interactions (i.e. synchronous parent-child interactions with parental sensitivity and responsiveness) during language exposure in natural language learning situations strongly influence both quantity and quality of the early infants' language learning. It is noteworthy that an increasing body of scientific research evidences has been consistently revealing that the *age-appropriate* linguistic experiences (i.e. *live* and *contingent* social interactions during language exposure) are integrally involved and play a potent and vital role in early infants' rapid language learning (Goldstein et al., 2003; Goldstein & Schwade, 2008; Kuhl et al., 2003; Kuhl, 2004 and 2007; Conboy & Kuhl, 2011; and Ramirez-Esparza et al., 2014).

Taken as a whole, it is clear that as the infant brain develops in the first few postnatal years of life, the developmental *timing* of the different brain functions such as sensory, memory, language, cognitive, social and emotional capabilities etc. link and coordinate with each other. Together they operate in a complex but wholly integrated manner that biologically equips the child with critical "*windows of opportunity*" for efficient and effective language and literacy learning, provided when the child is intimately and consistently engaged to experience ample and age-appropriate social interactions (i.e. growth-facilitating linguistic experiences) that are geared to optimizing child's language and literacy development.

5.5. Parent-Child Relationship – The Central Role and Total Process

The main implication of these findings is that children's early language and literacy acquisition is remarkably *relational* and dynamically *in*-becoming, for good or worse, depending on the ambient human agent. Just as what Ramirez-Esparza, Garcia-Sierra and Kuhl (2014) describe: "*one-on-one social contexts*". The potential dramatic impact can be manifested by the few instances of neglected children raised in social isolation, where the impact of social deprivation on children's language development can be so severe and negative to the extent that normal language skills are never acquired (Fromkin et al., 1974; and Kuhl, 2004). Given that infants are genetically predisposed to relate to people for their early language and literacy learning and they simply do not learn from any machines (e.g. TVs) as language instructors, it leads logically to a more fundamental question: Who is the best 'relational agent' for young children in language and literacy acquisition? Particularly for parents whose ultimate goal is to optimize their children's language and literacy development, a genuine answer to this question becomes prominent and eagerly awaited.

One might suggest literally any person who can take up the role as a "child caregiver" for young children. In human society, there are generally two basic types of childcare arrangements for preschool children (incl. infants and toddlers): parental childcare and non-parental childcare (e.g. Day Care Centers in the United States or domestic helpers in Hong Kong etc.). Parental childcare (usually by mothers) is regarded as the traditional form of childcare arrangement in most societies. However, because of the increasing number of mothers participating in the workforce (i.e. maternal employment) over the past few decades, non-parental childcare has grown steadily and has become a universal practice worldwide, especially in the more developed countries and regions. For examples, in the United States, while two-thirds of children had full-time parental childcare at home in the 1960s, only one-third of children had full-time parental childcare at home in the 2000s (Heinrich, 2014). In Hong Kong, as in this present sample dataset, more than 56% of the preschool children have non-parental childcare with most of them (i.e. 91%) have domestic helper(s) as their primary caregivers at home when both parents work.

Non-parental childcare has aroused much public debate over the past few decades, mostly because of its possible long-term detrimental effects on children's developmental functioning and well-being (e.g. cognitive and social-emotional development). Recent reviews on the findings from more than 30 years of research studies in the field had consistently converged to the same conclusion: the parental childcare is a much stronger predictor of positive and healthy children developmental outcomes than the non-parental childcare (Belsky et al., 2007; Erickson, 2011; and Center on the Developing Child at Harvard University, 2007). Young children spending longer hours in non-parental childcare (i.e. longer separations from parents) not only link more likely to certain negative social-emotional problems, but also decrease parents' sensitivity and hence their responsiveness in social interactions with their children (Erickson, 2011). In the context of Hong Kong, the problems of domestic helpers as primary caregivers for young children at home when both parents work have aroused public concern for many years. Examples of young children being neglected or even abused at home by domestic helpers have been widely reported (Groves & Lui, 2012). As in one case, reported by local newspapers, a domestic helper fed the baby with her urine (Ng & Chiu, 2010). Despite all these possible negative consequences, some might argue for potential beneficial influences of high-quality non-parental childcare on children's well-being (e.g. social functioning). However, *all* kinds of non-parental childcare cannot violate what I call it: the 'Shepherd Rationale' – which is originated from the Book of John in the Bible:

> *"The good shepherd lays down his life for the sheep. The hired hand is not the shepherd and does not own the sheep. So when he sees the wolf coming, he abandons the sheep and runs away. Then the wolf attacks the flock and scatters it. The man runs away because he is a hired hand and cares nothing for the sheep."* (NIV: John 10:11-13)

The Shepherd Rationale indicates that the *authentic shepherd* has the greatest concern for his own sheep in all aspects of the sheep's well-being. He intimately attaches to the sheep and tenderly cares for the sheep with all required provision and protection to the extent of his willingness to voluntarily risk or even sacrifice his life whenever necessary (i.e. "*lays down his life*"). It is this extreme *commitment* motivated by self-sacrificial *love* for the welfare of the sheep that qualified him as the authentic shepherd for the sheep. By the same token, this is the *essence* of parental childcare that contrasts sharply with the non-parental childcare (of any kind and whatever quality). Thus, if there is any human agent who is willing to lay down his/her life for a child, it is most probably the child's parents. In other words, it can be asserted that parent(s) is the best relational agent for their own children, not only in language and literacy acquisitions, but also in all other aspects of children's developmental functioning and well-being. This is the main reason why the parent-child relationship has always been emphasized as the central role in child development with great consistency over the past century in various fields of research such as personality development, socialization and developmental psychology etc. (Lamb & Lewis, 2011).

Parenting is defined as the parental behaviors that are required to protect, provide and support for child development in childrearing from infancy to adulthood (Johnson et al., 2014). Parenting practices are the parental behaviors defined by specific content, parental values and goals (Darling and Steinberg, 1993). As discussed previously, the nature of parent-child relationship primarily involves the whole historical series of day-to-day and cumulative dynamic parent-child interactions *over time* since the child's birth. In this sense, the parent-child literacy interaction is only a part of this history of parent-child interactions in daily life. Over the past five decades, a significant and conclusive body of research literature has confirmed, with widespread consensus, that the quality of parent-child relationship is the most important *family process variable* in shaping child's developmental trajectories and hence promotes positive and healthy child developmental outcomes in all aspects of child functioning and well-being (Lamb, 2012; and Johnson et al., 2014). Undoubtedly, parents differ in the levels of commitment in parenting and hence result in different parenting practices. Ultimately, these differences affect the quality of parent-child relationship, which is characterized by the degree of parental sensitivity in supporting appropriately and responding consistently to the child's individual needs and characteristics during the first few postnatal years (Lamb & Lewis, 2011; and Lamb, 2012). However, it has already been well-established in the research literature that both the fathers and mothers have the capacities to become good parents when they are physiologically prepared for parenthood (Fleming, 2005; and Gettler et al., 2011). When new mothers and fathers are willing to sincerely learn parental knowledge and genuinely devote their parental time to engage and interact responsively with, love and care consistently for their child in the stress-free situations at home, they can pick up most parenting skills through their own real-time parenting experiences and hence become competent parents over time (Gettler et al., 2011; and Lamb, 2012).

Taken all together, three salient and overarching characteristics of parents have been identified that determine the total process of attaining a high level of parent-child relationship quality for the ultimate goal of optimization of children's emergent literacy development during the preschool period: parental values and goals; parental time; and parental knowledge. Within the accounts of socialization research literature since the early twentieth century, it has already been established that parents' values and goals towards their children's development are the crucial determinants of parental behavior and hence parenting practices (Darling and Steinberg, 1993). As such, if parents are to move away from the current parenting milieu of focusing simply on their children's emergent literacy outcomes by seeking for the alternative approaches outside their immediate home literacy settings, it is critically important that they have to *re-orient* their parental values and goals towards the understanding of the imperative role of parent-child relationship in the course of creating an optimal home literacy environment for their own young children rather than just the children's emergent literacy itself. In other words, it is the *process,* not just the *outcome*, which is important. It is vital for parents to recognize that the total process of developing a high level of parent-child relationship quality during the preschool period not only forms the basis for successful development of children's early language and literacy, but also builds the common roots for developing children's competencies in all other aspects of children's healthy functioning and well-being that are both essential and crucial for their life-long prospects. In order to become competent parents and hence attain a high level of parent-child relationship quality who are capable to generate high quality parent-child interactions permeating in all home activities that are age-appropriate to the level of child development, parents should focus their ample attention and make substantial efforts not only on the child's language and literacy development, but also on all other aspects of child's developmental functioning and well-being (incl. biological development, cognitive development, moral and social-emotional development etc.). In this sense, achieving a high level of parent-child relationship quality is both a *learning process* for parents as well as a *nurturing process* for their young children.

5.6. PCRQ Commitment Model

The main implication of this fundamental reorientation of the parental values and goals towards the total process of attaining a high level of parent-child relationship quality in the first few postnatal years is that it inevitably requires a high level and continuous commitment in parenting from parents, which ultimately demands a paradigm shift of the existing parenting practices in the current parenting milieu. Accordingly, I develop and propose a PCRQ Commitment Model as shown in Figure 5.4 by translating the findings and observations from this present research and weaving them together with the insights from decades of rigorous science of the early childhood development. This model is a parenting planning framework that can help parents diagnose their existing parenting practices and thereby provide them with appropriate guidance for future decisions about their parenting practices with more effective strategies, which aim to increase the probabilities of attaining a higher level of parent-child relationship quality for the purpose of optimizing child developmental outcomes including children's emergent literacy development during the critical preschool period.

The model is a two–dimension framework of PCRQ commitment, structured in the form of a matrix according to the effects on parent-child relationship quality of parental time and parental knowledge and of patterns of parenting practices representing the intersection of these two salient dimensions. The PCRQ commitment (or commitment in parenting) is defined here as parents' willingness to *sacrifice* whatever valuable to the parents for parenting that is geared to attaining a high level of parent-child relationship quality during the first few postnatal years and thereby enhances their child's outcomes in all aspects of child functioning and well-being. Given the vulnerability of a child at birth and that the developing brain is both *experience-expectant* and *experience-dependent* during the first few postnatal years (Galbally et al., 2011; and Jabes & Nelson, 2014), significantly *intensive* and *sensitive* parental childcare are required. As such, parents' commitment in parenting is crucial for positive and healthy development of the child. An emerging number of neuroscience research studies has been suggesting that production of *oxytocin* in mothers across pregnancy and postnatal periods *facilitates* the maternal behaviors for nursing the child, *generates* affective and motivational states for maternal caregiving, and *initiates* the formation of an emotional bonding between the mother and infant (Galbally et al., 2011). In other words, the priming of commitment in parenting might itself be biologically founded in parents. However, it is clear that the levels of commitment in parenting vary significantly across parents. In particular, the varying levels of commitment in parenting are specifically manifested in the variations of two universal and overarching characteristics of parents: parental time and parental knowledge.

First, parental time is defined here as the amount of time devoted genuinely by parents for performing all the necessary parenting duties and tasks (i.e. *work content*). Agreeably, the higher is the level of commitment in parenting, the more is the parental time or vice versa. For instance, given the requirements for vitally intensive and sensitive parental childcare during the first few postnatal years, a highly committed parent(s) might actually sacrifice his or her career (e.g. full-time parental employment) in order to exchange for more parental time to nurture the child (e.g. full-time parental childcare) at home. This parent's decision and implementation of increasing parental time represent a dramatic shift of parenting practices from left to right in the commitment model in Figure 5.4 (e.g. from full-time non-parental childcare to full-time parental childcare). As the infant cries, struggles, discomforts, snuggles and smiles etc., parent(s) responds sensitively and consistently to the child's different signals by feeding, holding, hugging; expressing warmth, affections and encouragement, and being emotionally available to the child in daily life. Gradually, it is out of these intimate, day-by-day, dynamic parent-child interactions that the parent's feelings and sensitivity towards the child's needs, requests and characteristics grow and thereby develop their parent-child relationship quality over time.

Second, parental knowledge is defined here as the amount of knowledge (incl. skills or abilities) sincerely learned by parents for supporting the adequate performance of all the necessary parenting duties and tasks (i.e. *work performance*). Agreeably, the higher is the level of commitment in parenting, the more is the parental knowledge or vice versa. For instance, given the inherent complexities and difficulties of parenting during the first few postnatal years, a highly committed parent(s) might sacrifice his or her preferred social life (e.g. attending regular social gatherings) in order to exchange for more parental knowledge to improve his or her parenting practices (e.g. attending parenting training courses). This parent's decision and implementation of increasing the parental knowledge represent a dramatic shift of parenting competencies from bottom to top in the commitment model in Figure 5.4 (e.g. from low parent-child interaction quality to high parent-child interaction quality). As a developing child matures through the different developmental stages over time, certain tailor-made age-appropriate and growth-facilitating learning experiences are necessary for the child's efficient and effective learning. When parents sincerely make substantial efforts to learn the basic knowledge of child development [30], knowledge of children's emergent literacy development, knowledge of parenting[31], and knowledge of child healthcare[32] etc., the parents gradually become more competent in parenting their young children and thereby promote the positive growth of their parent-child relationship quality.

In practical endeavors, interaction of the two universal and overarching characteristics of a parent primarily reflects the parent's level of *implicit* commitment in parenting at a particular point in time, which is represented *explicitly* by the parenting practices and competencies in an integral and dynamic system that essentially determine eventual probabilities of attaining different levels of parent-child relationship quality and hence ultimately influence child developmental outcomes in all aspects of child functioning and well-being. While the total process of developing parent-child relationship quality involves incredible complexities in multiple facets of parenting and child development, the PCRQ Commitment Model is a comprehensive and integrated approach towards this developmental process that focuses on four *generic patterns* of parenting practices, depicted as four different quadrants shown in Figure 5.4:

Q1: Quadrant of Low PCRQ represents *Incompetent Parenting*
Q2: Quadrant of Deception represents *Partial Parenting ~ Type 1*
Q3: Quadrant of Wastage represents *Partial Parenting ~ Type 2*
Q4: Quadrant of High PCRQ represents *Competent Parenting*

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[30] Child development knowledge: e.g. major developmental milestones for a typically developing child, biological growth and physical growth etc.

[31] Parenting knowledge: e.g. the ways to support the child's learning, supervise the child's behaviors, set the limits and routines for the child, and seek necessary and appropriate parenting resources from relevant local government departments, research institutions and social communities etc.

[32] Child healthcare knowledge: e.g. understanding the child's medical conditions, preparation of the child's healthy diet, and the ways to prevent injury and treat emergencies etc.

Quadrant of High PCRQ (Q4) represents the generic pattern of *Competent Parenting* practices that is characterized by parents' highest level of implicit commitment in parenting, which is demonstrated explicitly by the interaction of both more parental time and adequate parental knowledge. Fundamentally, parents in Q4 quadrant are highly committed to the total process of developing parent-child relationship quality for the ultimate goal of optimization of child developmental outcomes in all aspects of child functioning and well-being. In general, these families are two-parent single-earner families with full-time parental childcare. Typically, one parent in each of these families (usually mothers) practically sacrifices the full-time parental employment in exchange for the full-time parental childcare to nurture the child at home. In addition, these parents sincerely make substantial efforts to learn parental knowledge to improve their parenting practices. Over time, these parents become more competent in parenting and hence better parent-child relationship quality develops (i.e. High PCRQ). In other words, the interaction between more parental time and adequate parental knowledge likely results in the total process of promoting the positive growth towards higher level of parent-child relationship quality and thereby attains higher probabilities of better parent-child relationship quality outcomes. Consequently, these competent parents are more sensitive and more capable to generate the high quality parent-child interactions (i.e. *age-appropriate* and *growth-facilitating* learning experiences), permeating in all home activities that are geared to optimizing child developmental outcomes in all aspects of child functioning and well-being including early language and literacy development. It is noteworthy that research has shown that while fathers (usually the bread-winner of each family) spend less time on average in caring for their children than mothers, young children typically become attached to both their fathers and mothers at about the same time in the middle of the first year (Lamb & Lewis, 2011; and Lamb, 2012). When fathers participate actively in caring for and interacting with their children, they can adapt physiologically and behaviorally in parenting (Gettler et al., 2011).

On the contrary, Quadrant of Low PCRQ (Q1) represents the generic pattern of *Incompetent Parenting* practices that is characterized by parents' lowest level of implicit commitment in parenting, which is demonstrated explicitly by the interaction of both less parental time and inadequate parental knowledge. Essentially, parents in Q1 quadrant are not committed (either unwilling or incapable[33]) to the total process of developing parent-child relationship quality. Normally, these families are two-parent dual-earner families with full-time non-parental childcare. Typically, these parents lack parental time to nurture the child at home and have inadequate parental knowledge to improve their parenting practices. In addition, because of longer separations between the parents and the child in daily life, particularly during the first few postnatal years, these parents are less sensitive and less responsive to the needs and characteristics of the child. Over time, these parents become incompetent in parenting and hence poor parent-child relationship quality develops (i.e. Low PCRQ). In other words, the interaction between less parental time and inadequate parental knowledge most likely results in the total process of diminishing the parent-child relationship quality and hence increases the probabilities of poor parent-child relationship quality outcomes. As discussed earlier, when young children spend much time in non-parental childcare, particularly during the first few postnatal years, they inevitably experience various forms of child neglect[34], which is defined as absence of sufficient attention, necessary protection and consistent responsiveness that are age-appropriate to a child's needs (Center on the Developing Child at Harvard University, 2012). Generally speaking, young children in these families most likely experience severe neglect in non-parental childcare (either in home settings or daycare center settings) though basic needs such as food, shelter and medical care might be met. For instances, in the case of home settings, non-parental childcare is typically provided by a domestic helper as primary caregiver who has little childcare training. As such, the child experiences significant and ongoing absence of the basic age-appropriate social interactions[35] necessary for positive and healthy child

[33] It should be noted that these families represent various family settings across a wide range of socio-economic spectrum, which include families where parents may be significantly stressed by social and/or economic hardship; overwhelmed by various chronic diseases, psychological and medical problems, and mental health impairments such as personality disorders, substance abuse (e.g. alcohol or illicit drugs) and post-traumatic stress disorder etc.

[34] While there are different types of child maltreatment such as child neglect, physical abuse, sexual abuse and psychological abuse etc., child neglect is generally the most prevalent type of child maltreatment and it includes four basic forms of neglect that are usually found to co-occur within the context of childrearing in the earliest years of child's life: (1) supervisory neglect (e.g. inadequate food and hygiene), (2) psychological neglect (e.g. inadequate attention to a child's social and emotional needs), (3) medical neglect (e.g. inadequate treatment for a child's health problem); and (4) educational neglect (e.g. inadequate provision to meet a child's formal learning needs) (Center on the Developing Child at Harvard University, 2012).

[35] In some serious cases, the domestic helper simply ignores an infant's crying and leaves her alone for many hours at a time at home when both parents work.

development and thereby cause serious physiological disruptions that might lead to adverse consequences in child development. In the case of daycare center settings, non-parental childcare is typically provided by a few caregivers vs. many young children. As such, one-on-one individualized social interaction is minimal and hence the child's needs and requests are simply ignored for virtually most of the time. As a result, persistent absence of biologically essential and developmentally expected experiences can threaten the child's positive development and healthy well-being that might have enduring and adverse consequences such as disrupted brain architecture, cognitive delays, language deficits, attention regulation difficulties; learning difficulties, socio-emotional and behavioral problems, mental health problems, and even physical health problems etc. (Pollak et al., 2000; Bakermans-Kranenburg et al., 2011; Barry et al., 2003; De Bellis, 2005; and Bruce et al., 2009).

Quadrant of Deception (Q2) represents the generic pattern of *Partial Parenting ~ Type 1* practices that is characterized by parents' low-to-moderate level of implicit commitment in parenting, which is demonstrated explicitly by the interaction of both less parental time but adequate parental knowledge. Basically, parents in Q2 quadrant are partially committed to the total process of developing parent-child relationship quality. Generally speaking, these families are two-parent dual-earner families with full-time non-parental childcare. Typically, these parents lack parental time to nurture the child at home because of their full-time parental employment. However, they are truly concerned about their children's developmental outcomes and well-being. As such, these parents may sincerely make substantial efforts to learn parental knowledge aiming to improve their parenting practices. Given that non-parental childcare is probably the 'only choice' of available childcare arrangements for these parents, they try their best to make their non-parental childcare (either in home settings or daycare center settings) as developmentally-appropriate as possible for their young children by incorporating relative-childcare (e.g. grandparents or aunties) as part of their parenting practices. These parents may sincerely plan daily routines and arrange daily learning schedules for their young children and hopefully expect their relatives to operationalize these plans and schedules on their behalf when both parents work during the daytime. Most likely, these parents are also actively seeking alternative private tutors to teach their young children because of their lack of parental time. In the case of home settings, the parents may create an enriched home learning environment (e.g. toys, DVDs, and picture storybooks etc.) for their young children. Non-parental childcare is mainly provided by the relative(s) as primary caregiver who is equipped with the parents' daily plans and schedules and assisted by domestic helper(s). In the case of daycare center settings, the parents may enroll their young children in high quality daycare centers as far as possible (e.g. well-trained staff and low staff-to-children ratio). Besides, these parents may make efforts to care for and socially interact with their young children at home after their daily working life. Despite these efforts of implementing parental knowledge (during the first few postnatal years) that are expected to have some positive effects, these parents are *confused* by the appearance of certain possible negative child outcomes (e.g. cognitive delays or social-emotional problems etc.) (i.e. Deception). Why? As discussed earlier, although high quality non-parental childcare might have some positive effects, it does not reduce the negative effects associated with young children spending long hours in non-parental childcare settings (Erickson, 2011). The lack of parental time is *mistakenly* regarded as acceptable when perceived suitable substitutes are provided as compensations and such perceptions are often driven by the parents' unwillingness to make further higher level of implicit commitment in parenting (e.g. sacrificing full-time parental employment in exchange for full-time parental childcare). Inevitably, because of longer separations between the parents and the child in daily life, particularly during the first few postnatal years, these parents are not sensitive enough to support appropriately and respond consistently to the particular needs and characteristics of the child during their parent-child interactions. Ultimately, parents' adequate parental knowledge has been severely constrained by the lack of parental time. Over time, these parents can only become partially competent in parenting. In other words, the interaction between less parental time and adequate parental knowledge likely results in the total process of limiting the growth towards a better parent-child relationship quality. In practice, it not only lowers the probabilities of attaining better parent-child relationship quality, but also increases the risks of developing poor parent-child relationship quality. Going without parents' notices, young children in these families may most likely experience ongoing and diminished level of age-appropriate and growth-facilitating social interactions when spending long hours in the non-parental childcare. Examples of such situations include only a few daily social interactions for engaging active conversations with young children; frequent and prolonged periods (e.g. for hours at a time) where the infants or toddlers are simply left in front of a television watching educational programmes or DVDs. Consequently, these prolonged under-stimulation situations ultimately lead to certain developmental delays in child outcomes such as cognitive delays, language deficits, social-emotional and behavior problems etc.

Quadrant of Wastage (Q3) represents the generic pattern of *Partial Parenting ~ Type 2* practices that is characterized by parents' moderate-to-high level of implicit commitment in parenting, which is demonstrated explicitly by the interaction of both more parental time but inadequate parental knowledge. Primarily, parents in Q3 quadrant are moderately committed to the total process of developing parent-child relationship quality. In general, these families are two-parent single-earner families with full-time parental childcare. Typically, these parents are truly concerned about and sincerely care for their children's developmental outcomes and well-being. As such, one parent in each of these families (usually mothers) sacrifices the full-time parental employment in exchange for the full-time parental childcare to nurture the child at home. However, these parents lack sufficient parental knowledge to improve their parenting practices. Although they might genuinely want to learn the parental knowledge, they do not make (either incapable or uninterested) substantial efforts (e.g. read materials about child development knowledge or attend parenting training courses etc.) in the learning process. Most likely, these parents are also actively seeking alternative private tutors to teach their young children because of their lack of parental knowledge. Inevitably, these parents have limited understanding about different developmental stages of the developing child and hence the knowledge about child's sensitive periods during the first few postnatal years. Consequently, they are not competent enough to generate tailor-made age-appropriate and growth-facilitating learning experiences in a timely fashion for their developing child that can capitalize the critical *windows of opportunities* for efficient and effective learning for the ultimate purpose of optimization of child developmental outcomes in all aspects of child functioning and well-being (i.e. Wastage). The lack of parental knowledge leads to parents' procrastination in parenting and thereby results in the occurrence of intermittent diminished attention for the child in daily life. Fortunately, the full-time parental childcare settings provide ample opportunities for the loving parents to practically learn the basic parental knowledge "on the job" by trial and error. When parents intimately and consistently engage their children in daily active conversations and stimulating parent-child interactions, parental sensitivity and responsiveness towards the child's particular needs and characteristics grow gradually and thereby positive parent-child relationship quality develops over time. In other words, the interaction between more parental time and inadequate parental knowledge likely results in the total process of developing positive growth in parent-child relationship quality and hence increases the probabilities of attaining moderate-to-high level of parent-child relationship quality, which ultimately contributes towards positive child outcomes. On the other hand, if the parents are not actively and sincerely involved in daily parenting practices given the full-time parental childcare settings (e.g. rely habitually on domestic helper(s) for most parenting tasks), the risk of developing low parent-child relationship quality increases. It is noteworthy that while the parents with *Partial Parenting ~ Type 2* practices (Q3) are not fully geared towards the optimization of child developmental outcomes in all aspects of child functioning as compare to the parents with *Competent Parenting* practices (Q4), they are actually in the better position in the total process of developing higher level of parent-child relationship quality than the parents with *Partial Parenting ~ Type 1* practices (Q2). This indicates that the effects of parental time outweigh the effects of parental knowledge when parents actively and practically pick up most parenting skills through their real-time parenting experiences in daily life, usually in the full-time parental childcare settings.

In sum, these four generic patterns of parenting practices represent four different categories of total process for developing parent-child relationship quality that can help determine the eventual probabilities of attaining different levels of PCRQ during the first few postnatal years, which ultimately influence child developmental outcomes in all aspects of child's healthy functioning and well-being. This PCRQ Commitment Model proposes that parents' level of implicit commitment in parenting is manifested in the interaction between parental time and parental knowledge, which are essential and universal characteristics of *all* parents regardless of culture, socio-economic status and ethnicity. In other words, it has wide applicability to a heterogeneous population of families in parenting during the first few postnatal years. In essence, the varying levels of parents' implicit commitment in parenting are manifested in differential *variations* in and *interactions* of parental time and parental knowledge in combination not only across parents, but also across time for the same parent(s) in a family. It is clear that no parent is perfectly consistent in parenting practices over time and across family situations (e.g. environmental, parent-related and/or child-related circumstances etc.). However, it is contended that parents do follow general tendencies in their approaches of parenting practices in accordance with their levels of implicit commitment in parenting that are reflected by these two universal and overarching characteristics of parents. In other words, it is possible to evaluate the PCRQ levels based on the prevailing parenting practices employed. Most importantly, these evaluations can provide parents with valuable advice and guidance for future decisions about their parenting practices, aiming to increase the probabilities of attaining higher PCRQ levels for the ultimate goal of optimization of child developmental outcomes in all aspects of child's healthy functioning and well-being including children's emergent literacy development during the critical preschool period.

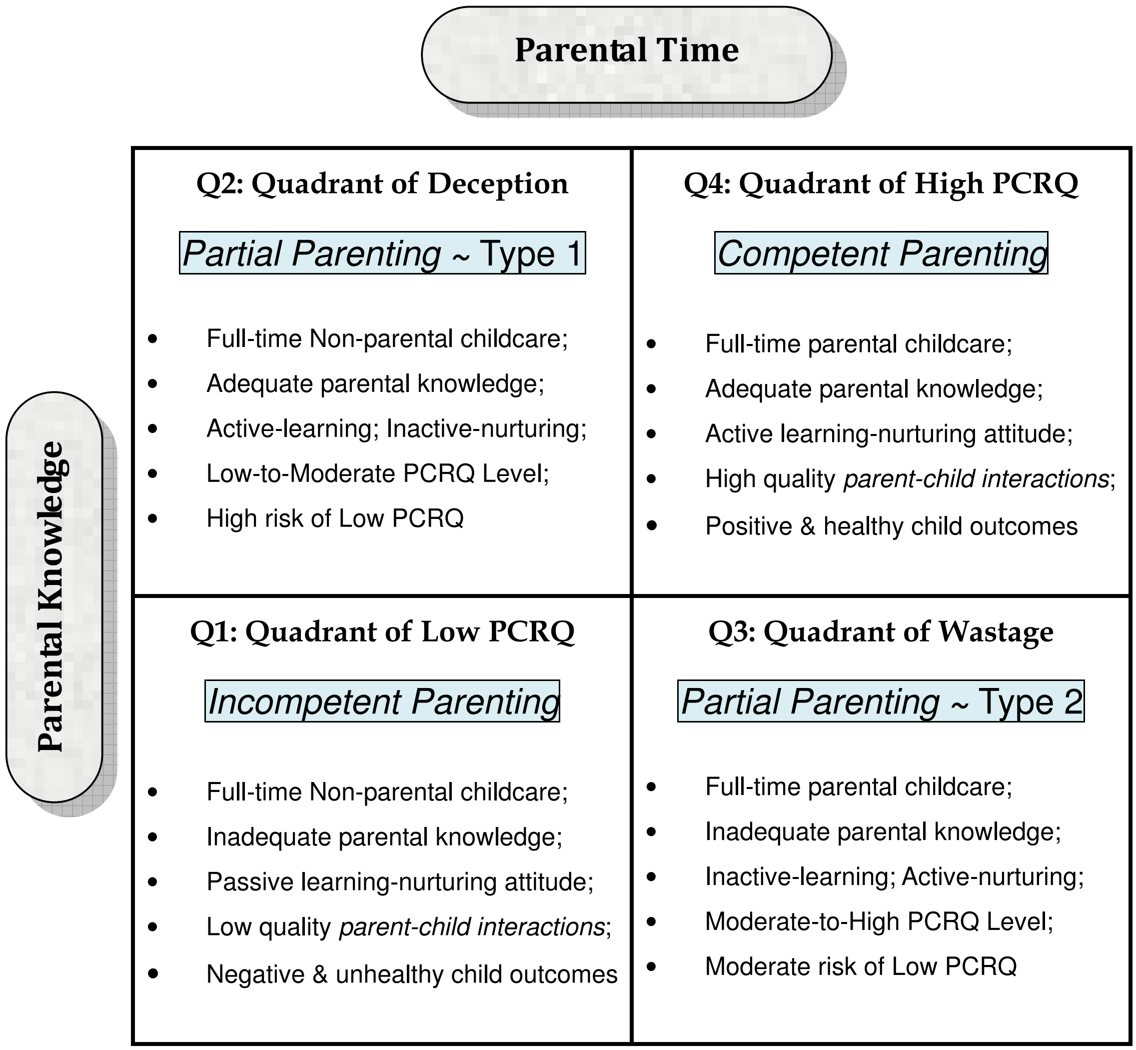


Figure 5.4: The PCRQ Commitment Model

5.7. Recommendations

My main emphasis in this thesis has been on the developmental process of children's emergent literacy and the home and family variables that associate with emergent literacy outcomes, especially the role of parent-child relationship and the home literacy environment. My task aims to provide an integrated picture about how children's emergent literacy develops and thereby how this developmental process should be enhanced for preschool children. From the investigation of the parent-child literacy mediation theory to the discovery of the PCRQ Commitment Model, I have critically reviewed a substantial body of research literatures from various research disciplines and traditions and I hope to weave together the insights of the research findings from both this present research and the existing research literatures into clear guidelines for helping parents promote the development of children's emergent literacy. The cumulative science base has been developed sufficient enough to put recommendations about the development of children's emergent literacy on sound scientific foundation.

During the first few years of life, a typical developing child is biologically prepared and developmentally equipped with critical *windows of opportunity* for efficient and effective language learning and literacy acquisition. Early language and literacy acquisition are determined by complex and multiple factors. However, it is clearly evidenced that the developing child is shaped interactively by both genes and experiences over time and young children typically acquire optimal language and literacy skills through relatively similar processes and predictable sequences that ultimately converge on mastering of three essential and interdependent building blocks: decoding, comprehension and motivation. The efficacy of the developmental process of children's early language and literacy acquisition is only *limited* by parents.

Childrearing is a parenting process with inherent complexities and difficulties (Johnson et al., 2014). The quality of parent-child relationship is the most important *family process variable* in shaping child's developmental trajectories and hence promotes positive and healthy child outcomes in all aspects of child's functioning and well-being (Lamb, 2012; and Johnson et al., 2014). It is crystal clear from this present research study that creating an optimal home literacy environment embedded in a high parent-child relationship quality is fundamental to the successful development of optimal children's emergent literacy outcomes. During the first few postnatal years, the vital importance of the role of parent-child relationship is at the heart of this developmental process. Thus, the central recommendation characterizes the nurturing of a high parent-child relationship quality that can ultimately optimize children's emergent literacy development in this critical preschool period. It is acknowledged that the total process of nurturing of a high quality parent-child relationship in the first few postnatal years requires parents who are highly-committed in parenting, sincerely-motivated for healthy child development, well-prepared for parenthood, and receiving continuous support services founded on sound scientific knowledgebase from appropriate local government agencies and researchers in relevant fields. Therefore, I make the recommendations to address these issues.

As a beneficial starting point, it is absolutely essential that parents, particularly new parents, should diagnose their existing parenting practices employed by adopting the PCRQ Commitment Model as a parenting planning tool to evaluate PCRQ development in their prevailing family settings. These evaluations not only vividly portray parenting life of parents at a particular point in time, but also provide parents with appropriate guidance for future decisions about their parenting practices and hence help parents derive more effective strategies from the model that suit their particular family conditions. Given the centrality of developing a high level of parent-child relationship quality for the purpose of optimization of children's emergent literacy development, parents should re-orient their parental values and goals towards the total process of attaining a high level of parent-child relationship quality in the course of creating an optimal home literacy environment for their young children. Attaining a high level of parent-child relationship quality is both a learning process for parents as well as a nurturing process for children. This fundamental reorientation inevitably poses vitally important challenges on parents, especially working parents (i.e. mothers also joining the workforce), to make a high level of commitment in parenting during the first few postnatal years. A high level of implicit commitment in parenting is demonstrated explicitly by the interaction of both more parental time and adequate parental knowledge, which represents the generic pattern of competent parenting practices that is conducive to the total process of promoting positive growth towards a high level of parent-child relationship quality, which is characterized by better parental sensitivity in supporting appropriately and responding consistently to the needs and characteristics of the developing child in daily life. More specifically, competent parenting requires vitally intensive and sensitive parental childcare, especially during the earliest years of child's life. Being sincerely motivated by self-sacrificial love for the welfare and long-term positive prospects of the developing child, one of the parents (usually mother) of each individual family should practically sacrifice full-time parental employment in exchange for full-time parental childcare to nurture the child at home. Besides, parents should earnestly make substantial efforts to learn the parental knowledge such as child development knowledge, emergent literacy development knowledge, parenting knowledge and child healthcare knowledge etc. to continuously improve their parenting practices. Over time, as parents become more competent in parenting and thereby a better parent-child relationship quality develops (i.e. High PCRQ), they become more sensitive and more capable to generate high quality parent-child interactions (i.e. *age-appropriate* and *growth-facilitating* learning experiences), permeating in all home activities that are geared to optimizing child developmental outcomes in all aspects of child functioning and well-being including early language and literacy development. In other words, parents should pay painstaking attention and make substantial efforts not only on the children's language and literacy development, but also on all the other aspects of child developmental functioning and well-being (incl. biological development, cognitive development and social-emotional development etc.). Parents should be alert for signs of developmental delays in any aspects of child functioning and difficulties (or disabilities) in early language learning and literacy acquisition that their young children are experiencing in daily life. When parents have a genuine concern about their child's development that is apparently lagging behind in some respect, they should earnestly seek appropriate expert advice as early as possible and supportive (or supplementary) interventions should be provided if necessary.

In practical endeavors, parents should provide adequate developmentally-appropriate home literacy resources in the natural home settings to promote their young children's language and literacy growth in daily life. Throughout the earliest years, sufficient age-appropriate home literacy resources (i.e. interest-oriented and beneath frustration level for the child etc.) are vitally important not only to support young children's daily independent exploration and literacy experiences at home, but also to help foster their motivation for literacy and thereby consolidate their independent reading and writing capacities. In addition, parents should actively engage young children in purposeful and productive home activities in daily life such as parent-child shared storybook reading, family daily rituals; joint-work family production; family shared recreation; family traveling; fun plays; literacy games and songs etc. These daily purposeful and productive activities in the natural home settings provide ample opportunities for parents to generate high quality age-appropriate and growth-facilitating parent-child literacy interactions with enriched daily real-life and authentic experiences that parents can gauge their young children's ZPD for efficient and effective language learning and literacy acquisition. In other words, parents' creativity is the limit. For instances, these parent-child literacy interactions may stimulate active conversations for enhancing language and literacy growth (e.g. vocabulary and print concepts); direct explicit attention to the sound structure of spoken words and oral language (e.g. alphabetic principle and phonological awareness); emphasize the relationships between print and contextual meaning in daily life; encourage regular practices of word recognition/production and reading aloud meaningful texts; promote talk about storybooks with comprehension strategies (e.g. summarizing main idea, drawing inferences and predicting events from upcoming texts etc.); and inspire meaningful questions for facilitating the process of learning through reasoning and discoveries etc. For bilingual (or multi-lingual) families, parents should capitalize, as far as possible, on the intrinsic developmental plasticity of the child's developing brain for acquiring more than one language at the same time. The developing child in the earliest years is biologically equipped with the capacity to acquire second language(s) simultaneously by providing ongoing opportunities of continuous exposures and high quality age-appropriate and growth-stimulating parent-child literacy interactions, using multiple languages on a daily basis (i.e. applying the same basic principles identified above in single language and literacy acquisition).

Thus far, one might argue that this fundamental reorientation of parental values and goals towards the total process of attaining a high level of parent-child relationship quality in the early childhood years that results in optimization of child developmental outcomes in all aspects of child functioning and well-being is *only* realistic (or possible), in reality, for a small number of better-off families (e.g. middle-class and high-income families) who are capable of affording a high level of commitment in parenting as reflected explicitly by interaction of both more parental time and adequate parental knowledge during the earliest years of children's life. Yes, that is true to a certain extent. However, this is exactly where the indispensable role of a responsible government comes into play. It has been increasingly recognized that future prosperity and sustainability of any society, in facing the growing challenges of global economies and competitions, depend on the health and well-being of its next generation who will become responsible citizens, productive workers and committed parents. The basic principles of the science of early childhood development and the economics of human capital formation have been consistently suggesting that the societal investment in young children's development increases the rate of return on investment over time in later lives and ultimately not only improve the lives of individuals (e.g. increased personal earnings), but also address the problems of future prosperity and security of the society at large such as reduced social welfare and crime costs, and increased tax revenues etc. (Masse & Barnett, 2002; Cunha et al., 2005; Karoly et al., 2005; Knudsen et al., 2006; Heckman et al., 2007; and National Scientific Council on the Developing Child, 2007). Given the extensive scientific evidence on the centrality and the vital importance of nurturing a high level of parent-child relationship quality during the first few postnatal years, a responsible government should leverage the advances in science and thereby fight for a reasonable balance between individual and shared social responsibilities and achieve a public consensus around the sound and evidence-based choices within the context of home and family processes among alternative early childhood development policies in order to provide all young children with essential developmental needs that can build a strong and healthy foundation for their later lives.

To this end, the PCRQ Commitment Model provides an organized framework through the lens of commitment in parenting that can possibly lead to informative insights and evidence-based implications for policymakers who are charged with developing and implementing early childhood development policies within the child welfare system. A set of three compelling levels of government intervention is particularly worthy of note for thoughtful consideration: facilitation; prevention and rehabilitation.

First, families representing moderate-to-high levels and the highest level of implicit commitment in parenting (i.e. families in Quadrants Q3 and Q4) are basically adopting full-time parental childcare for nurturing their young children at home. What these families really need is continuous improvement of their parental knowledge and hence prevailing parenting practices based on sound scientific knowledgebase. As such, government should work collaboratively with relevant research institutions and various professional bodies (e.g. pediatricians; speech and language specialists etc.) to *facilitate* these needs through various policy initiatives that can provide a wide range of evidence-based guidelines, effective parent education and parenting training courses. These science-based initiatives should aim to promote construction of supportive and responsive parent-child relationships and creation of growth-facilitating learning experiences for all aspects of healthy child's functioning and well-being including the emphasis on children's the early language development and literacy acquisition.

Second, families representing the lowest level and low-to-moderate levels of implicit commitment in parenting (i.e. families in Quadrants Q1 and Q2) are primarily adopting full-time non-parental childcare. Given the adverse developmental impacts of longer separations between the parents and child in daily life during the sensitive periods in the first few postnatal years, *prevention* strategies of increasing parental time and continuous improvement of the non-parental childcare quality for these families is the key to mitigate the adverse impacts and hence increases potentially greater societal returns in the long run. As a consequence, government should cooperate with employers in private business sectors to derive child-oriented and research-based policy initiatives that can provide a variety of wise and viable parental options in parental leave policies. These parental leave policies should aim to provide possibilities of job security as required by these families and vital necessities of more parental time to develop and nurture parent-child relationships that are essential for healthy child development during the earliest years of life. For instances, viable parental options may include extending as far as possible the length and coverage of parental leave, and providing a meaningful period of subsidized (or unpaid) parental leave if necessary etc.

On the one hand, government should derive various supportive policy initiatives (e.g. tax incentives) to encourage creation of more part-time jobs in the market, which aim to potentially increase the parental time for those parents who are striving to stay at home for looking after their young children but also at the same time are compelled to work for achieving their families' financial stability. These preventive interventions can be derived through various initiatives sponsored by employers in private sectors, non-government organizations (NGO), voluntary community-based organizations and government-funded services etc. On the other hand, government should collaborate with voluntary associations and private organizations to promote the development and establishment of an affordable and high quality early childcare and education system, which is characterized by the provision of an environment of reliable relationships for the vulnerable young children with interactive and relational mode of non-parental childcare that can capitalize on young children's natural interests and intrinsic drive to learn in daily life (National Scientific Council on the Developing Child, 2004). It is acknowledged that well-trained and well-qualified childcare personnel, having the expertise, skills and capacity to build an environment of child-oriented and positive childcare relationships with children, are critically important determinants in maximizing the value of early childcare and education system. Therefore, substantial investments in developing high quality non-parental childcare services (e.g. professional training; recruitment and retention, competitive salaries and fringe benefits, opportunities for career advancement, respected and valued profession etc.) must be a top priority in the social policy agendas. In addition, effective parenting training courses should be specifically designed to address the particular conditions of these families, which aim not only to help these parents create a growth-stimulating home environment that promotes the growth towards better parent-child relationship quality and provides enriched early literacy experiences for their young children at home, but also to further challenge their commitment in parenting.

Third, severe child neglect and other types of child maltreatment (e.g. physical abuse and sexual abuse etc.) occur in a variety of different family settings across a wide range of socio-economic spectrum. For instances, parents of these families may be stressed significantly by social-economic hardship; overwhelmed seriously by various chronic diseases, psychological and medical problems, depression and mental health impairments such as personality disorders, substance abuse (e.g. addictions to alcohol and illicit drugs), and post-traumatic stress disorder etc. Generally speaking, these families represent the lowest level of implicit commitment in parenting (i.e. families in Quadrant Q1: particularly those with low income and limited education level). Young children in these families are deemed to be (or at risk of) experiencing severe neglect or other types of maltreatment. Prolonged periods of severe neglect and child maltreatment in the early childhood years have long-term detrimental consequences on a developing child's brain architecture, learning capabilities, cognition and language development, physical and mental health that lead to enduring adverse effects in the child's later life persisting into adolescence. The basic principle of developmental plasticity and the concept of sensitive periods in early child development indicate the need of urgency and the critical importance of timing for *rehabilitation* of neglected and maltreated young children in the society. The early and effective rehabilitation of these families and hence the most vulnerable young children not only increases the probabilities of the greatest recovery for these maltreated young children, but also generates the highest return on investment over time for the society at large (National Scientific Council on the Developing Child, 2007; and Center on the Developing Child at Harvard University, 2012). Consequently, government should coordinate with various child-welfare professional bodies across different social service sectors (e.g. medical, mental health and legal etc.) to develop effective approaches that can identify these most vulnerable young children and families as early as possible. The earliest possible identification of these neediest families and children for receiving appropriate intervention can mitigate substantially the long-term detrimental effects of adverse environments and experiences on young children's development, and thereby reduce ultimate societal costs of special education services and social welfare assistance etc. Examples of developing effective identification approaches include development of sophisticated developmental expertise and evidence-based assessment tools/services so as to avoid the dangers of both under-identification and over-identification of the inadequate childcare family settings; and provision of more outreach to families having the potentials of facing considerable adversity that can put their young children at an increasing risk of experiencing severe neglect or other types of child maltreatment at different degrees.

In addition, government should direct more targeted investments to the early intervention system for the development and implementation of research-based rehabilitation programmes and specialized social services that are designed specifically to address a variety of distinctive needs of these vulnerable families and the neglected young children. The centrality and the important role of parent-child relationship in early childhood development suggest that these rehabilitation programmes and specialized services should be geared to reconstructing parents' capacities and commitment in parenting and family resources within the context of home and family processes, which not only can eradicate severe child neglect conditions as far as possible from recurring, but also can ultimately re-orient parents' values and goals towards the total process of developing parent-child relationship quality in natural home environment. Several research-based rehabilitation models such as Child-Parent Psychotherapy (CPP) (Lieberman et al., 2005); Attachment and Biobehavioral Catch-up (ABC) Intervention (Dozier et al., 2009); and Multidimensional Treatment Foster Care for Preschoolers (MTFC-P) programme (Fisher & Kim, 2007); can provide a promising and compelling starting point.

In sum, a responsible government should promote a better public understanding of the basic science of early child development and the vital role of parent-child relationship during the first few postnatal years and thereby provide a powerful impetus for the development and implementation of research-derived early childhood policies and evidence-based early intervention strategies that build a sturdier social infrastructure to support families in promoting healthy child development and making a significant difference in the lives of all young children. The well-being of our next generation and the prosperity of our collective future demand a concerted effort and commitment from parents, government and the society at large.

5.8. Limitations and Future Research

There are several limitations in this present research study that are worthy of note for future research. First, the sample composition of this present study for the investigation of the parent-child literacy mediation theory represents predominantly a socially homogeneous population of middle-class families (i.e. relatively well-educated parents and higher household income). As such, the research results (i.e. the effect sizes) might be attenuated by the homogeneity of the sample and hence it might not reflect a heterogeneous population of the families in Hong Kong. Future research studies should replicate these findings with more heterogeneous samples that include diverse family characteristics across a wide range of socio-economic spectrum and hence determine the wider applicability and generalizability of the results found in this present study.

Second, although the sample size is large enough for evaluating each of the measuring instruments used for the purpose of this empirical study, it is not sufficiently large enough to provide a random split of the dataset into two equally-sized samples for both evaluation and cross-validation for each of the measuring instruments. Thus, future research is needed to cross-validate the performance and confirm the utility of these measuring instruments for further empirical studies.

Third, confirmatory factor analysis is used to evaluate the measuring instruments (i.e. PCRQ, PCLI, HLR and GRTR!-Revised) in this present research study. In essence, the use of CFA prioritizes observed data (i.e. invariance is assumed as an essential property of data). Consequently, when the observed sample dataset does not fit the specified measurement model, the measurement scale is refined until a measurement model, based on a *priori* hypothetical measurement theory, is found to best fit (i.e. account for) the observed sample dataset. In other words, the selection of specific items for and the psychometric properties of each of the measuring instruments, as evaluated by using CFA, are sample-dependent. However, Rasch measurement theory (RMT) prioritizes the mathematical model, which is characterized by the principles of invariance (i.e. stability) for making comparisons in measurement for both measuring instruments and persons (Andrich, 2004 and 2011; and Hobart et al., 2007). More specifically, the RMT approach estimates a person's latent trait based on the mathematical model that relates the person's observed response patterns to the set of scale items and the psychometric properties of these calibrated items in the measurement scale (Sharkness & DeAngelo, 2011). In other words, an estimate of a person's latent trait is independent of the specific items in the measuring instrument and the psychometric properties of these items are independent of the sample characteristics. Thus, future research should incorporate the RMT approach in development and evaluation of the measuring instruments and thereby create, as far as possible, a sample-free measure for each of these measurement scales.

Fourth, the measuring instruments used here were limited to a certain extent in terms of scope and content because of the fewer items available in the item pools: 6 items for PCRQ; 6 items for PCLI; 3 items for HLR; and 25 items for GRTR!-Revised. In other words, they might not provide a comprehensive picture for each of the conceptualized latent constructs. Besides, although using fewer items reduces response burden of respondents and hence increases measurement efficiency that is important in the context of this empirical study, it might sacrifice the level of measurement precision as required unless adaptive measuring instruments based on item response theory (IRT) or RMT are available. The IRT and RMT approaches are not new statistical methods for developing measuring instruments in social sciences. However, there application in the field of children's emergent literacy is still relatively scarce to date. Future research should develop more comprehensive measures with improved levels of measurement precision based on the utilization of larger item bank with more diverse items in terms of item characteristics (e.g. item difficulty) that can tap into the same latent construct being measured so that more appropriately calibrated items can be selected from the item bank of each measuring instrument for future research.

Fifth, the PCRQ Commitment Model posits that the four generic patterns of parenting practices can help determine the eventual probabilities of attaining different levels of PCRQ in the first few postnatal years that ultimately influence child developmental outcomes in all aspects of child functioning and well-being. This model does not explicitly take into account the contextual factors such as culture, ethnicity and family SES etc., in which parenting practices occur. While the impacts of multiple contextual factors on parental values and goals that in turn shape the parenting practices should be acknowledged, it is contended that both *universality* (i.e. applicability for all parents and hence universal features of parenting) and *flexibility* (i.e. ability to incorporate burgeoning evidence of varying contextual influences on parenting practices) are essential and hence are taken into consideration in the development of a general model of commitment in parenting so that it has a wide applicability to a more heterogeneous population of families in parenting. In terms of universality, the model proposes that the four generic patterns of parenting practices represent an interactive and integrative conceptualization of *all* four possible categories of parents' levels of implicit commitment in parenting, manifested in the interaction between parental time and parental knowledge. Agreeably, both parental time and parental knowledge are the universal and overarching characteristics of all parents essential for parenting at any different levels of parenting competence and at any different time across all cultures, ethnicities and family SES. Stated simply, parents' varying levels of implicit commitment in parenting, as reflected in the theoretical interplay of parental time and parental knowledge, transcends all contextual influences to support the total process of developing different levels of parent-child relationship quality. Given the central goal of attaining high levels of PCRQ for the ultimate optimization of child developmental outcomes, any variations of (or differences in) the '*what*' and the '*how*' parents can do to achieve it are more likely, to a certain extent, cultural (or context) dependent. Therefore, the model is designed with the flexibility to incorporate different contextual variations as far as future research can find supportive evidence. The model basically comprises the full range of varying levels of parents' implicit commitment in parenting that are manifested in and can be quantified by the differential variations in and interactions of parental time and parental knowledge in combination not only across parents, but also across time for same parent(s) in a family. Conceptualization of the model's four distinct quadrants as depicted in Figure 5.4 provides an integrated framework for future research to inform any meaningful variations, comprehensive description and concrete examples of evidence-based context-specific (or cultural-specific) parenting practices within each quadrant that is confined by the respective generic pattern of parenting practices. Future validation research studies of this PCRQ Commitment Model should provide further elucidation for calibrating parents' different levels of implicit commitment in parenting that are based on the manifestation in the interaction between parental time and parental knowledge and hence reveal eventual probabilities of attaining the corresponding levels of PCRQ as well as the relative contributions of specific PCRQ levels to various child developmental outcomes through the total family process.

5.9. Conclusion

Children's emergent literacy outcomes can be optimized during the earliest years of life. However, much foundation work has to be done. At family level, it requires substantial commitment in parenting from parents towards the total process of nurturing a high level of parent-child relationship quality, which is fundamental not only to the creation of an optimal home literacy environment that is conducive to successful development of children's emergent literacy, but also to the optimization of children's developmental outcomes in all other aspects of child functioning and well-being. At societal level, it requires aggressive deployment of social resources and concerted effort of the society at large towards the development and implementation of research-derived early childhood policies and evidence-based early intervention strategies that together can build a sturdier social infrastructure to support families in promoting healthy child development for all young children. Decades of rigorous scientific research has consistently converged on the fundamental principle that the process of early child development is a function of interplay between nature and nurture over time. The efficacy of child developmental process is only limited by parents. Ultimately, a high level of implicit commitment in parenting from parents is the best intervention for optimization of child developmental outcomes in all aspects of child functioning and well-being including early language and literacy development. The investigation of parent-child literacy mediation theory and the proposed PCRQ Commitment Model in this present research study have offered parents, policymakers and society with a more comprehensive and integrative picture about the total family process of child development, in particular on how the children's emergent literacy develops and hence how it can be enhanced for all young children beginning in the earliest years of life.

References

Adams, M.J. (1990). *Learning to read: Thinking and learning about print*. Cambridge, MA: MIT Press.

Ainsworth, M.D.S., Blehar, M.C., Waters, E. and Wall, S. (1978). *Patterns of attachment: A psychological study of the Strange Situation*. Hillsdale, NJ: Erlbaum.

Aish, A.M. and Wasserman, D. (2001). Does Beck's Hopelessness Scale really measure several components? *Psychological Medicine*, 31, 367-372.

Allington, R.L. (1984). Content, coverage and contextual reading in reading groups. *Journal of Reading Behavior*, 16, 85-96.

Andrich, D. (2004). Controversy and the Rasch Model: A characteristic of incompatible paradigms? *Medical Care*, 42(1), I7-I16.

Andrich, D. (2011). Rating scales and Rasch measurement. *Expert Review of Pharmacoeconomics and Outcomes Research*, 11(5), 571-585.

Aram, D. (2008). Parent-child interaction and early literacy development. *Early Education and Development*, January, 19(1), 1-6.

Aram, D. and Levin, I. (2002). Mother-child joint writing and storybook reading: Relations with literacy among low SES kindergartens, *Merrill-Palmer Quarterly*, 48, 202-224.

Aram, D. and Levin, I. (2004). The role of maternal mediation of writing to kindergartners in promoting literacy in school: A longitudinal perspective. *Reading and Writing: An Interdisciplinary Journal*, June, 17(4), 327-431.

Armbruster, B.B., Lehr, F. and Osborn, J. (2003). *Proven ideas from research for parents: A child becomes a reader: Kindergarten through Grade 3*. Portsmouth, NH: RMC Research Corporation.

Arnold, D.S. and Whitehurst, G.J. (1994). Accelerating language development through picture book reading. In Dickinson, D. (Eds.), *Bridges to literacy: Approaches to supporting child and family literacy*. Cambridge, MA: Blackwell.

Au, K.H. (1998). Social constructivism and the school literacy learning of students of diverse backgrounds. *Journal of Literacy Research*, 20, 297-310.

Bacon-Shone, J. and Bolton, K. (1998). Charting multilingualism: Language censuses and language surveys in Hong Kong. In Pennington, M. (Eds.), *Language in Hong Kong at century's end*. Hong Kong: Hong Kong University Press, 43-90.

Badian, N. (1998). A validation of the role of preschool phonological and orthographic skills in the prediction of reading. *Journal of Learning Disabilities*, 31, 472-481.

Badian, N.A. (2000). Do preschool orthographic skills contribute to prediction of reading? In Badian, N. (Eds.), *Prediction and prevention of reading failure*. Timonium, MD: York Press.

Baker, C. (2001). *Foundations of Bilingual Education and Bilingualism*. Celvedon, GBR: Multilingual Matters Limited.

Baker, C.E. (2013). Fathers' and mothers' home literacy involvement and children's cognitive and social emotional development: Implications for family literacy programs. *Applied Developmental Science*, 17(4), 184-197.

Baker, C.E. (2014a). Mexican mothers' English proficiency and children's school readiness: Mediation through home literacy involvement. *Early Education and Development*, 25, 338-355.

Baker, C.E. (2014b). African American fathers' contributions to children's early academic achievement: Evidence from two-parent families from the early childhood longitudinal study-birth cohort. *Early Education and Development*, 25, 19-35.

Baker, C.E., Cameron, C.E., Rimm-Kaufman, S.E. and Grissmer, D. (2012). Family and sociodemographic predictors of school readiness among African American boys in kindergarten. *Early Education and Development*, 23, 883-889.

Baker, L., Fernandez-Fein, S., Scher, D. and Williams, H. (1998). Home experiences related to the development of word recognition. In Metsala, J.L. and Ehri, L.C. (Eds.), *Word recognition in beginning literacy*, pp. 263-287, Mahwah, NJ: Erlbaum.

Bakermans-Kranenburg, M.J., Steele, H., Zeanah, C.H., Muhamedrahimov, R.J., Vorria, P., Dobrova-Krol, N.A., Steele, M., van IJzendoorn, M.H., Juffer, F. and Gunnar, M.R. (2011). III. Attachment and emotional development in institutional care: Characteristics and catch up. *Monographs of the Society for Research in Child Development*, 76(4), 62-91.

Barnard, K.E. and Martell, L.K. (1995). Mothering. In Bornstein M.H. (Ed.), *Handbook of Parenting*. Mahwah, NJ: Lawrence Erlbaum Associates.

Barry, R.J., Clarke, A.R. and Johnstone, S.J. (2003). A review of electrophysiology in attention-deficit/hyperactivity disorder: I. Qualitative and quantitative electroencephalography. *Clinical Neurophysiology*, 114(2), 171-183.

Baumrind, D. (1978). Parental disciplinary patterns and social competence in children. *Youth and Society*, March, 9, 239-276.

Beals, D.E., and DeTemple, J.M. (1992). Home contributions to early language and literacy development. *National Reading Conference*, 42, 207-215.

Beals, D.E., DeTemple, J.M. and Dickinson, D.K. (1994). Talking and listening that support early literacy development of children from low-income families. In Dickinson, D.K. (Ed.), *Bridges to literacy: Children, families and schools*, pp. 19-40, Cambridge, MA: Blackwell.

Bear, D.R., Invernizzi, M., Templeton, S. and Johnston, F. (2004). *Words their way: Word study for phonics, vocabulary, and spelling instruction* (3rd ed.). Upper Saddle River, NJ: Pearson Education.

Belsky, J., Vandell, D.L., Burchinal, M., Clarke-Stewart, K.A., McCartney, K., Owen, M.T. and The NICHD Early Child Care Research Network (2007). Are there long-term effects of early child care? *Child Development*, 78(2), 681-701.

Bianchi, S.M. and Milkie, M.A. (2010). Work and family research in the first decade of the 21st century. *Journal of Marriage and Family*, 72, 705-725.

Bingham, G.E. (2002). *Testing a model of parent-child relationships, parent-child joint book reading, and children's emergent literacy skills*. Unpublished doctorate thesis, Purdue University, USA.

Blake, F.G. (1954). *The child, his parents and the nurse*. Philadelphia: J.B. Lippincott.

Blatchford, P., Burke, J., Farquhar, C. and Plewis, I. (1987). Associations between preschool reading related skills and later reading achievement. *British Educational Research Journal*, 13, 15-23.

Bornstein, M.H., and Cheah, C.S.L. (2006). The place of "culture and parenting" in the ecological contextual perspective on developmental science. In Rubin, K.H. and Chung, O.B. (Eds.), *Parenting beliefs, behaviors, and parent-child relations: A cross-cultural perspective*, pp. 3-33, New York: Psychology Press.

Boudreau, D. (2005). Use of a parent questionnaire in emergent and early literacy assessment of preschool children. *Language, Speech, and Hearing in Schools*, 36, 33-47.

Bourdieu, P. (1986). The forms of capital. In Richardson, J.G. (Ed.), *Handbook of Theory and Research for the Sociology of Education*. New York: Greenwood Press.

Bowey, J. (1995). Socioeconomic status differences in preschool phonological sensitivity and first-grade reading achievement. *Journal of Educational Psychology*, 87, 476-487.

Bowlby, J. (1984). *Attachment and loss: Vol. 1. Attachment (Revised Edition)*. London: Pelican.

Bowlby, J. (1988). *A secure base: Clinical applications of attachment theory*. London: Routledge.

Bracken, S.S. and Fischel, J.E. (2008). Family reading behavior and early literacy skills in preschool children from low-income backgrounds. *Early Education and Development*, 19(1), 45-67.

Bradley, R.H. (1989). The use of the HOME inventory in longitudinal studies of child development. In Bornstein, M.H. and Krasnegor, N.A. (Eds.), *Stability and continuity in mental development: Behavioral and biological perspectives*, pp. 191-215, Hillsdale, NJ: Lawerence Erlbaum Associates.

Bray, M. and Kwok, P. (2003). Demand for private supplementary tutoring: Conceptual considerations and socio-economic patterns in Hong Kong. *Economics of Education Review*, 22(6), 611-620.

Britto, P.R., Brooks-gunn, J. and Griffin, T.M. (2006a). Maternal reading and teaching patterns: Associations with school readiness in low-income African American families. *Reading Research Quarterly*, 41, 68-89.

Britto, P.R., Fuligini, A.S. and Brooks-Gunn, J. (2006b). Reading ahead: Effective interventions for young children's early literacy development. In Dickinson, D.K. and Neuman, S.B. (Eds.), Handbook of early literacy research, Vol.2, pp. 311-333, New York: Guildford Press.

Brody, G.H., Stoneman, Z. and McCoy, J.K. (1994). Contributions of protective and risk factors to literacy and socioemotional competency in former Head Start children attending kindergarten. *Early Childhood Research Quarterly*, 9, 407-425.

Bronfenbrenner, U. (1986). Ecology of the family as a context for human development: Research perspectives. *Developmental Psychology*, 22, 723-742.

Brown, R., Pressley, M., Van-Meter, P., and Schuder, T. (1996). A quasi-experimental validation of transactional strategies instruction with low-achieving second grade readers. *Journal of Educational Psychology*, 88, 18-37.

Brown, T.A. (2006). *Confirmatory Factor Analysis for Applied Research*. New York: The Guilford Publications, Inc.

Bruce, J., Fisher, P.A., Pears, K.C. and Levine, S. (2009). Morning cortisol levels in preschool-aged foster children: Differential effects of maltreatment type. *Developmental Psychobiology*, 51(1), 14-23.

Bruner, J. (1972). Nature and uses of immaturity. *American Psychologist*, 27, 687-708.

Burchinal, M.R., Peisner-Feinberg, E., Pianta, R. and Howes, C. (2002). Development of academic skills from preschool through second grade: Family and classroom predictors of developmental trajectories. *Journal of School Psychology*, 40, 415-436.

Burgess, S. (2005). The preschool home literacy environment provided by teenage mothers. *Early Childhood Development and Care*, 175, 249-258.

Burgess, S.R., Hecht, S.A. and Lonigan, C.J. (2002). Relations of the home literacy environment (HLE) to the development of reading-related abilities: A one-year longitudinal study. *Reading Research Quarterly*, 37, 408-426.

Bus, A.G. (2001). Joint caregiver-child storybook reading: A route to literacy development. In Dickinson, D.K. and Neuman, S.B. (Eds.), *Handbook of Early Literacy Research,* pp. 179-191, New York: The Guilford Press.

Bus, A.G. and van Ijzendoom, M.H. (1988). Mother-child interactions, attachment, and emergent literacy: A cross-sectional study. *Child Development*, 59, 1262-1272.

Bus, A.G. and van Ijzendoom, M.H. (1992). Patterns of attachment in frequently and infrequently reading mother-child dyads. *The Journal of Genetic Psychology,* 153(4), 395-403.

Bus, A.G. and van Ijzendoom, M.H. (1995). Mothers reading to their 3-year-olds: The role of mother-child attachment security in becoming literate. *Reading Research Quarterly*, 30, 998-1015.

Bus, A.G. and van Ijzendoom, M.H. (1997). Affective dimension of mother-infant picture book reading. *Journal of School Psychology*, 35, 47-60.

Bus, A.G. and van Ijzendoom, M.H. (1999). Phonological awareness and early reading: a meta-analysis of experimental training studies. *Journal of Educational Psychology*, 91, 403-414.

Bus, A.G., van Ijzendoom, M.H. and Pellegrini, A.D. (1995). Joint book reading makes for success in learning to read: A meta-analysis on intergenerational transmission of literacy. *Review of Educational Research*, Spring, 65, 1-21.

Bus, A.G., van Ijzendoom, M.H. and Crnic, K. (1997). Attachment and book reading patterns: A study of mothers, fathers, and their toddlers. *Early Childhood Research Quarterly*, 12, 81-98.

Byrne and Fielding-Barnsley, R. (1995). Evaluation of a program to teach phonemic awareness to young children: A 2- and 3-year follow-up and a new preschool trial. *Journal of Educational Psychology*, 87, 488-503.

Cabell, S.Q., McGinty, A.S. and Justice, L.M. (2007). Assessing print knowledge. In Pence, K.L. (Ed.), *Assessment in emergent literacy: A volume in the emergent and early literacy series*, pp. 327-375, San Diego, CA: Plural Publishing, Inc.

Caravolas, M., Volin, J., and Hulme, C. (2005). Phoneme awareness is a key component of alphabetic literacy skills in consistent and inconsistent orthographies: Evidence from Czech and English children. *Journal of Experimental Child Psychology*, 92, 107-139.

Castles, A., and Coltheart, M. (2004). Is there a causal link from phonological awareness to success in learning to read? *Cognition*, 91, 77-111.

Catts, H.W., Fey, M.E., Tomblin, J.B. and Zhang, X. (2002). A longitudinal investigation of reading outcomes in children with language impairments. *Journal of Speech, Language and Hearing Research*, 45(6), 1142-1157.

Catts, H., Fey, M., Zhang, X., and Tomblin, B. (1999). Language basis of reading and reading disabilities: Evidence from a longitudinal investigation. *Scientific Studies of Reading*, 3, 331-361.

Center on the Developing Child at Harvard University (2007). *The Science of Early Childhood Development* (In Brief). Retrieved from www.developingchild.harvard.edu.

Center on the Developing Child at Harvard University (2012). *The Science of Neglect: The Persistent Absence of Responsive Care Disrupts the Developing Brain: Working Paper 12*. Retrieved from www.developingchild.harvard.edu.

Chall, J.S., Jacobs, V. and Baldwin, L. (1990). *The reading crisis: Why poor children fall behind*. Cambridge, MA: Harvard University Press.

Chan, E. (2002). Beyond Pedagogy: language and identity in post-colonial Hong Kong. *British Journal of Sociology of Education*, 23(2), 271-285.

Cheng, K.M. (1997). English is not simply a foreign language. *Hong Kong Economic Journal*, 24, April.

Cheung, G.W. and Lau, R.S. (2008). Testing mediation and suppression effects of latent variables: Bootstrapping with structural equation models. *Organizational Research Methods*, 11(2), 296-325.

Cheung, M.W.L. (2007). Comparison of approaches to constructing confidence intervals for mediating effects using structural equation models. *Structural Equation Modeling*, 14(2), 227-246

Cheung, Y.S. (1984). The uses of English and Chinese languages in Hong Kong. *Language Learning and Communication*, 3, 273-283.

Chinese Government (1992). *The Basic Law of Hong Kong Special Administrative Region of the People's Republic of China*. Hong Kong: One Country, Two Systems Economic Research Institute.

Clay, M.M. (1989). Concepts about print in English and other languages. *The Reading Teacher*, 42(4), 268-276.

Clay, M.M. (2013). *An observation survey of early literacy achievement (3rd ed.)*. Portsmouth, NH: Heinemann; Auckland, New Zealand: Pearson.

Conboy, B.T. and Kuhl, P.K. (2011). Impact of second-language experience in infancy: Brain measures of first- and second-language speech perception. *Developmental Science*, 14(2), 242-248.

Cossu, G., Shankweiler, D., Liberman, I.Y., Katz, L., and Tola, G. (1988). Awareness of phonological segments and reading ability in Italian children. *Applied Psycholinguistics*, 9, 1-16.

Coyne, M.D., Kame'enui, E., Simmons, D.C. and Harn, B.A. (2004). Beginning reading intervention as inoculation or insulin: First-grade reading performance of strong responders to kindergarten instruction. *Journal of Learning Disabilities*, 37, 90-104.

Crain-Thoreson, C. and Dale, P.S. (1992). Do early talkers become early readers? Linguistic precocity, preschool language, and early reading. *Developmental Psychology*, 28, 421-429.

Cunha, F., Heckman, J., Lochner, L. and Masterov, D. (2005). *Interpreting the evidence on life skill formation: Working Paper No. 10091*. Cambridge, MA: National Bureau of Economic Research.

Cunningham, A.E. and Stanovich, K.E. (1990). Assessing print exposure and orthographic processing skill: A quick measure of reading experience. *Journal of Educational Psychology*, 82, 733-740.

Cunningham, A.E. and Stanovich, K.E. (1993). Children's literacy environments and early word recognition subskills. *Reading and Writing: An Interdisciplinary Journal*, 5, 193-204.

Cunningham, A.E. and Stanovich, K.E. (1998). Early reading acquisition and its relation to reading experience and ability 10 years later. *Developmental Psychology*, 33, 934-945.

Curenton, S.M. and Justice, L.M. (2004). African American and Caucasian preschooler's use of decontextualized language. *Language, Speech and Hearing Services in School*, 35, 240-253.

Dang, H.A. and Rogers, F.H. (2008). *How to interpret the growing phenomenon of private tutoring: Human capital deepening, inequality increasing, or waste of resources?* Policy Research Working Paper 4530. Washington, DC: The World Bank.

Darling, N. and Steinberg, L. (1993). Parenting Style as Context: An Integrative Model. *Psychological Bulletin*, 113(3), 487-496.

de Jong, P.F. and Leseman, P.P.M. (2001). Lasting effects of home literacy on reading achievement in school. *Journal of School Psychology*, 39, 389-414.
de Jong, P.F. and van der Leij, A. (2003). Developmental changes in the manifestations of a phonological deficit in Dutch children. *Journal of Educational Psychology*, 95, 22-40.

De Bellis, M.D. (2005). The psychobiology of neglect. *Child Maltreatment*, 10(2), 150-172.

DeTemple, J.M. (2001). Parents and children reading books together. In Dickinson, D.K. and Tabors, P.O. (Eds.), *Beginning literacy with language: Young children learning at home and school*. Baltimore: Brookes.

Dickinson, D.K. and Neuman, S.B. (2006). Introduction. In Dickinson, D.K. and Neuman, S.B. (Eds.), *Handbook of Early Literacy Research*, Vol. 2, pp. 1-8, New York: The Guilford Press.

Dickinson, D.K. and Snow, C. (1987). Interrelationships among pre-reading and oral language skills in kindergarten from two social classes. *Early Childhood Research Quarterly*, 2, 1-25.

Dickinson, D.K. and Tabors, P.O. (2001). *Beginning literacy with language: Young children learning at home and school*. Baltimore: Brookes.

Dillman, D.A., Smyth, J.D. and Christian, L.M. (2009). *Internet, Mail, and Mixed-Mode Surveys: The Tailored Design Method (3rd ed.)*. New Jersey: John Wiley & Sons, Inc.

DiStefano, C. (2002). The impact of categorization with confirmatory factor analysis. *Structural Equation Modeling*, 9(3), 327-346.

Dozier, M., Lindhiem, O., Lewis, E., Brick, J., Bernard, K. and Peloso, E. (2009). Effects of a Foster Parent Training Program on young children's attachment behaviors: Preliminary evidence from a randomized clinical trial. *Child and Adolescent Social Work Journal*, 26(4), 321-332.

Echols, L.D., West, R.F., Stanovich, K.E. and Zehr, K.S. (1996). Using children's literacy activities to predict growth in verbal cognitive skills: A longitudinal investigation. *Journal of Educational Psychology*, 88, 296-304.

Education Bureau (2011). *Profile of Kindergartens and Kindergarten-cum-child Care Centres*. Retrieved on 1 April, 2011 from http://www.chsc.hk/kindergarten/

Education Bureau (2012). *Kindergarten Education in Hong Kong*. Retrieved on 26 June, 2012 from http://www.edb.gov.hk/en/edu-system/preprimary-kindergarten/about-preprimary-kindergarten/index.html

Edwards, C.M. (2014). Maternal literacy practices and toddlers' emergent literacy skills. *Journal of Early Childhood Literacy*, 14(1), 53-79.

Ehri, L.C. and Roberts, T. (2006). The roots of learning to read and write: Acquisition of letters and phonemic awareness. In Dickinson, D.K. and Neuman, S.B. (Eds.), *Handbook of early literacy research*, Vol.2, pp. 113-131, New York: Guilford Press.

Entwisle, D.R. and Alexander, K.L. (1996). Family type and children's growth in reading and math over the primary grades. *Journal of Marriage and the Family,* May, 58(2), 341-355.

Erickson, J.J. (2011). *The effects of day care on the social-emotional development of children*. FamilyFacts.org, Report No. 2, pp. 1-31. Retrieved from http://familyfacts.org/reports/2/the-effects-of-day-care-on-the-social-emotional-development-of-children

Estrada, P., Arsenio, W.F., Hess, R.D. and Holloway, S.D. (1987). Affective quality of the mother-child relationship: Longitudinal consequences for children's school-relevant cognitive functioning. *Developmental Psychology*, 23, 210-215.

Evans, S. (2000). Hong Kong's new English language policy in education. *World Englishes*, 19(2), 185-204.

Evans, M.A. and Saint-Aubin, J. (2005). What children are looking at during shared book reading: Evidence from eye movement monitoring. *Psychological Science*, 16, 913-920.

Evans, M.A. and Saint-Aubin, J. (2008). Eye movements of senior kindergarten children reading an alphabet book and relationship to their letter knowledge. In Evans, M.A. (Eds.), *New perspectives on young children's acquisition and application of alphabetic knowledge*. Symposium conducted at the Society for the Scientific Study of Reading, Asheville, NC.

Evans, M.A. and Shaw, D. (2008). Home grown for reading: Parental contributions to young children's emergent literacy and word recognition. *Canadian Psychology*, 49(2), 89-95.

Evans, M.A., Shaw, D. and Bell, M. (2000). Home literacy activities and their influence on early literacy skills. *Canadian Journal of Experimental Psychology*, 54, 65-75.

Farrington, A.M. and Lonigan, C.J. (2013). Examining the measurement precision and invariance of the Revised Get Ready to Read! Journal of Learning Disabilities, XX(X) 1-12. DOI: 10.1177/0022219413495568.

Finney, S.J. and DiStefano, C. (2006). Non-normal and categorical data in structural equation modeling. In G.R. Hancock and R.O. Mueller (Eds.), *Structural Equation Modeling: A second course* (pp. 269-314). Greenwich, CT: Information Age Publishing.

Fisher, P.A. and Kim, H.K. (2007). Intervention effects on foster preschoolers' attachment-related behaviors from a randomized trial. *Prevention Science*, 8(2), 161-170.

Fitzgerald, J., Spiegel, D.L. and Cunningham, J.W. (1991). The relationship between parental literacy level and perceptions of emergent literacy. *Journal of Reading Behavior*, 23, 191-213.

Fleming, A.S. (2005). Plasticity of innate behavior: Experiences throughout life affect maternal behavior and its neurobiology. In Carter, C.S., Ahnert, L., Grossmann, K.E., Hrdy, S.B., Lamb, M.E., Porges, S.W. and Sachser, N. (Eds.), *Attachment and bonding: A new synthesis*, pp. 137-168. Cambridge MA: MIT Press.

Fletcher, J.M., Coulter, W.A., Reschly, D.J., and Vaughn, S. (2004). Alternative approaches to the definition and identification of learning disabilities: Some questions and answers. *Annals of Dyslexia*, 54, 304-331.

Flora, D.B. and Curran, P.J. (2004). An empirical evaluation of alternative methods of estimation for confirmation factor analysis with ordinal data. *Psychological Methods*, 9(4), 466-491.

Foulin, J. (2005). Why is letter-name knowledge such a good predictor of learning to read? *Reading and Writing*, 18, 129-155.

Foy, J.G. and Mann, V. (2003). Home literacy environment and phonological awareness in preschool children: Differential effects for rhyme and phoneme awareness. *Applied Psycholinguistics*, 24, 59-88.

Francis, D.J., Shaywitz, S.E., Stuebing, K.K., Shaywitz, B.A. and Fletcher, J.M. (1996). Development lag versus deficit models of reading disability: A longitudinal individual growth curve analysis. *Journal of Educational Psychology*, 88, 3-17.

Fritjers, J.C., Barron, R.W. and Brunello, M. (2000). Direct and mediated influences of home literacy and literacy interest on prereaders' oral vocabulary and early written language skill. *Journal of Educational Psychology*, 92, 466-477.

Fritz, M.S. and MacKinnon, D.P. (2007). Required sample size to detect the mediated effect. *Psychological Science*, **18**(3), 233-239.

Fromkin, V., Krashen, S., Curtiss, S., Rigler, D. and Rigler, M. (1974). The development of language in genie: A case of language acquisition beyond the "critical period". *Brain and Language*, 1(1), 81-107.

Galbally, M., Lewis, A.J., van IJzendoorn, M. and Permezel, M. (2011). The role of oxytocin in mother-infant relations: A systematic review of human studies. *Harvard Review of Psychiatry*, 19(1), 1-14.

Gettler, L.T., McDade, T.W., Feranil, A. and Kuzawa, C.W. (2011). Longitudinal evidence that fatherhood decreases testosterone in human males. *Proceedings of the National Academy of Sciences*, 108(39), 16194-19199.

Girolametto, L. and Weitzman, E. (2002). Responsiveness of child care providers in interactions with toddlers and preschoolers. *Language, Speech and Hearing Services in Schools*, 33, 268-281.

Goikoetxea, E. (2005). Levels of phonological awareness in preliterate and literate Spanish-speaking children. *Reading and Writing*, 18, 51-79.

Goldstein, M.H., King, A.P. and West, M.J. (2003). Social interaction shapes babbling: Testing parallels between birdsong and speech. *Proceedings of the National Academy of Sciences*, 100(13), 8030-8035.

Goldstein, M.H. and Schwade, J.A. (2008). Social feedback to infants' babbling facilitates rapid phonological learning. *Psychological Science*, 19(5), 515-523.

Gottfried, A.E. (1990) Academic intrinsic motivation in young elementary school children. *Journal of Educational Psychology*, 82, 525-538.

Gottfried, A.E., Fleming, J.S. and Gottfried, A.W. (1998). Role of cognitively stimulating home environment in children's academic intrinsic motivation: A longitudinal study. *Child Development*, 69, 1448-1460.

Gough, P.B. and Tunmer, W. (1986). Decoding, reading and reading disability. *Remedial and Special Education*, 7, 6-10.

Greaney, V. and Hegarty, M. (1987). Correlates of leisure time. *Journal of Research in Reading*, 10, 3-20.

Griffin, E.A. and Morrison, F.J. (1997). The unique contribution of home literacy environment to differences in early literacy skills. *Early Child Development and Care*, Vol. 127-128, pp. 233-243.

Groves, J.M. and Lui, L. (2012). The 'Gift' of help: Domestic helpers and the maintenance of hierarchy in the household division of labour. *Sociology*, 46(1), 57-73.

Hair, J.F., Black, W.C., Babin, B.J. and Anderson, R.E. (2010). *Multivariate Data Analysis (7th ed.)*. New Jersey: Pearson Education, Inc.

Hammett, L.A., van Kleeck, A. and Huberty, C.J. (2003). Patterns of parents' extra textual interactions during book sharing with preschool children: A cluster analysis study. *Reading Research Quarterly*, 38, 442-468.

Hammill, D.D. (2004). What do we know about the correlates of reading? *Exceptional Children*, 70, 453-469.

Haney, M. and Hill, J. (2004). Relationships between parent-teaching activities and emergent literacy in preschool children. *Early Child Development and Care*, 174(3), 215-228.

Hayes, A.F. (2009). Beyond Baron and Kenny: Statistical mediation analysis in the new millennium. *Communication Monographs*, **76**(4), 408-420.

Heckman, J.J., Malofeeva, L., Pinto, R. and Savelyev, P.A. (2007). *The effect of the Perry Preschool Program on the cognitive and non-cognitive skills of its participants*. Unpublished report. Department of Economics, University of Chicago.

Heinrich, C.J. (2014). Parents' employment and children's well-being. *The Future of Children*, 24(1), 121-146.

Hess, R.D., Holloway, S.D., Dickson, W.P. and Price, G.G. (1984). Maternal variables as predictors of children's school readiness and later achievement in vocabulary and mathematics in sixth grade. *Child Development*, 55, 1902-1912.

Hessling, R. M., Traxel, N. M., and Schmidt, T. J. (2004). Ceiling effect. In M. S. LewisBeck, A. Bryman, & T. F. Liao (Eds.), *SAGE encyclopedia of social science research methods* (p. 106). Thousand Oaks, CA: Sage.

Hinde, R. A. (1979). *Towards understanding relationships*. London: Academic Press.

Hinde, R.A. (1995). A suggested structure for a science of relationships. *Personal Relationships*, 2, 1-15.

Hinde, R. A. and Stevenson-Hinde (1987). Interpersonal relationships and child development. *Developmental Review*, 7, 1-21.

Hobart, J.C., Cano, S.J., Zajicek, J.P. and Thompson, A.J. (2007). Rating scales as outcome measures for clinical trials in neurology: Problems, solutions, and recommendations. *THE LANCET Neurology*, 6(12), 1094-1105.

Hood, M., Conlon, E. and Andrews, G. (2008). Preschool home literacy practices and children's literacy development: A longitudinal analysis. *Journal of Educational Psychology*, 100, 252-271.

Iacobucci, D., Saldanha, N. and Deng, X.Y. (2007). A meditation on mediation: evidence that structural equations models perform better than regressions. *Journal of Consumer Psychology*, 17(2), 140-154.

Ireson, J. and Rushforth, K. (2011). Private tutoring in the English education system: Its nature, extent and purpose. *Research Papers in Education*, 26(1), 1-19.

Ireson, J. and Rushforth, K. (2014). Why do parents employ private tutors for their children? Exploring psychological factors that influence demand in England. *Journal of Educational Research Online*, 6(1), 12-33.

Jabes, A. and Nelson, C.A. (2014). Neuroscience and child well-being. In Ben-Arieh, A., Frones, I., Casas, F. and Korbin, J.E. (Eds.), *Handbook of child well-being: theories, methods and policies in global perspective*, Vol. 1, pp. 219-247. Dordrecht: Springer.

Johnson, B.D., Berdahl, L.D., Horne, M., Richter, E.A. and Walters, M. (2014). A Parenting Competency Model. *Parenting: Science and Practice*, 14, 92-120.

Johnson, J.S. and Newport, E.L. (1989). Critical period effects in second language learning: The influence of maturational state on the acquisition of English as a second language. *Cognitive Psychology*, 21(1), 60-99.

Johnson, R.K. (1994). Language policy and planning in Hong Kong. *Annual Review of Applied Linguistics*, 14, 177-199.

Jordan, G.E., Snow, C.E. and Porche, M.V. (2000). Project EASE: The effect of a family literacy project on kindergarten students' early literacy skills. *Reading Research Quarterly*, 35, 524-546.

Joreskog, K.G. (1990). New developments in LISREL: analysis of ordinal variables using polychoric correlations and weighted least squares. *Quality and Quantity*, 24, 387-404.

Joreskog, K.G. (1994). On the estimation of polychroic correlations and their asymptotic covariance matrix. *Psychometrika,* 59(3), 381-389.

Joreskog, K.G. (2005). *Structural Equation Modeling with Ordinal Variables using LISREL*. Lincolnwood, IL: Scientific Software International.

Joreskog, K.G. and Sorbom, D. (1996) *LISREL 8: User's reference guide*. Chicago: Scientific Software International.

Joreskog, K.G. and Sorbom, D. (2006). *LISREL 8.80 for Windows*. Lincolnwood, IL: Scientific Software International.

Justice, L.M., Chow, S., Capellini, C., Flanigan, K. and Colton, S. (2003). Emergent literacy intervention for vulnerable preschoolers: Relative effects of two approaches. *American Journal of Speech-Language Pathology*, 12, 320-332.

Justice, L.M. and Ezell, H.K. (2000). Enhancing children's print and word awareness through home-based parent intervention. *American Journal of Speech-Language Pathology*, 9, 257-269.

Justice, L.M. and Ezell, H.K. (2001). Written language awareness in preschool children from low-income households: A descriptive analysis. *Communication Disorders Quarterly*, 22, 123-134.

Justice, L.M. and Ezell, H.K. (2002). Use of storybook reading to increase print awareness in at-risk children. *American Journal of Speech-Language Pathology*, 11, 17-29.

Justice, L.M. and Ezell, H.K. (2004). Print referencing: An emergent literacy enhancement strategy. *Language, Speech, and Hearing Services in the Schools*, 35, 185-193.

Justice, L.M., Kaderavek, J., Bowles, R. and Grimm, K. (2005). Language impairment, parent-child shared reading, and phonological awareness: A feasibility study. *Topics in Early Childhood Special Education*, 25, 143-156.

Kaplan, D. (2009). *Structural equation modeling: Foundations and extensions* (2nd ed.). Thousand Oaks, CA: Sage.

Karoly, L.A., Kilburn, M.R. and Cannon, J. (2005). *Early Childhood Interventions: Proven Results, Future Promise*. RAND Corporation, MG-341.

Kirby, J.R., Roth, L., Desrochers, A. and Lai, S.S.V. (2008). Longitudinal predictors of word reading development. *Canadian Psychology*, 49(2), 103-110.

Kline, R.B. (2011) *Principles and Practice of Structural Equation Modeling (3rd ed.)*. New York: The Guilford Publications, Inc.

Knudsen, E.I. (2004). Sensitive periods in the development of the brain and behavior. *Journal of Cognitive Neuroscience*, 16(8), 1412-1425.

Knudsen, E.I., Heckman, J.J., Cameron, J.L. and Shonkoff, J.P. (2006). Economic, neurobiological, and behavioral perspectives on building America's future workforce. *Proceedings of the National Academy of Sciences*, 103(27), 10155-10162.

Kuhl, P.K. (2004). Early language acquisition: Cracking the speech code. *Nature Reviews Neuroscience*, 5, 831-843.

Kuhl, P.K. (2007). Is speech learning 'gated' by the social brain? *Developmental Science*, 10(1), 110-120.

Kuhl, P.K. (2009). Early language acquisition: phonetic and word learning, neural substrates, and a theoretical model. In Moore, B.C.J., Tyler, L.K. and Marslen-Wilson, W.D. (Eds.), *The Perception of Speech: From Sound to Meaning,* pp. 103-132. New York: Oxford University Press.

Kuhl, P.K. (2010). Brain mechanisms in early language acquisition. *Neuron*, 67(5), 713-727.

Kuhl, P.K. (2011). Early language learning and literacy: Neuroscience implications for education. *Mind, Brain, and Education*, 5(3), 128-142.

Kuhl, P.K., Conboy, B.T., Coffey-Corina, S., Padden, D., Rivera-Gaxiola, M. and Nelson, T. (2008). Phonetic learning as a pathway to language: new data and native language magnet theory expanded (NLM-e). *Philosophical Transactions of the Royal Society B: Biological Sciences*, 363, 979-1000.

Kuhl, P.K., Tsao, F.M. and Liu, H.M. (2003). Foreign-language experience in infancy: Effects of short-term exposure and social interaction on phonetic learning. *Proceedings of the National Academy of Sciences*, 100(15), 9096-9101.

Kwok, L.Y.P. (2004). Emergence of demand for private supplementary tutoring in Hong Kong: Argument, indicators and implications. *Hong Kong Teachers' Centre Journal*, 3, 1-14.

Lamb, M.E. (2012). Mothers, fathers, families, and circumstances: Factors affecting children's adjustment. *Applied Developmental Science*, 16(2), 98-111.

Lamb, M.E. and Lewis, C. (2011). The role of parent-child relationships in child development. In Bornstein, M.H. and Lamb, M.E. (Eds.), *Developmental Science: An advanced textbook (6th ed.)*, pp. 469-517. New York: Taylor and Francis.

Landry, S.H. and Smith, K.E. (2006). The influence of parenting on emergent literacy skills. In Dickinson, D.K. and Neuman, S.B. (Eds.), *Handbook of Early Literacy Research*, Vol. 2, pp. 135-148, New York: The Guilford Press.

Landsmann, L.T. and Karmiloff-Smith (1992). Children's understanding of notations as domains of knowledge versus referential-communicative tools. *Cognitive Development*, 7, 287-300.

Lau, C.G.L., Lee, D.P.L. and Rao, N. (2011). Facilitating the development of the under threes: observations from Hong Kong. *The 2011 Asia-Pacific Regional Conference on Early Childhood (ARNEC)*, Singapore, 8-10 November 2011, In ARNEC Conference 2011 Final Program, 2011, p.56.

Lau, Y.K. (2010). The impact of fathers' work and family conflicts on children's self-esteem: The Hong Kong case. *Social Indicators Research*, 95(3), 363-376.

Lau, Y.K., Ma, J.L.C., Wan, P.S. and Lai, L.Y. (2014). The work-family interface in Hong Kong: Implications for social work practice. *Journal of Family Social Work*, 17, 3-20.

Lee, C.G., Park, H.J. and Lee, H. (2009). Shadow education systems. In Sykes, G., Schneider, B. and Plank, D.N. (Eds.), *Handbook of education policy research*, pp. 901-919. New York: NY: Routledge.

LeFevre, J.A. and Senechal, M. (2002). *Learning to read in a second language: Parent involvement still count*. Symposium presentation at the International Society for the Study of Behavioral Development Biennial Meeting, Ottawa, Ontario.

Leseman, P.P.M. and de Jong, P.F. (1998). Home literacy: Opportunity, instruction, cooperation, and social-emotional quality predicting early reading achievement. *Reading Research Quarterly*, 33, 294-318.

Lethbridge, H. (1976). *Hong Kong: Stability and Change*. Hong Kong: Oxford University Press.

Levin, I. and Bus, A.G. (2003). How is emergent writing based on drawing? Analyses of children's products and their sorting by children and mothers. *Developmental Psychology*, 39, 891-905.

Levitt, P. (2014). Toxic stress and its impact on early learning and health: Building a formula for human capital development. In Little, O. and Bogenschneider, K. (Eds.), *The Science of Early Brain Development: A Foundation for the Success of Our Children and the State Economy (1st ed.)*, The 32nd Wisconsin Family Impact Seminar, pp. 9-21.

Levy, B.A., Gong, Z., Hessels, S., Evans, M.A. and Jared, D. (2006). Understanding print: Early reading development and the contributions of home literacy experiences. *Journal of Experimental Child Psychology*, 93, 63-93.

Li, H., Wong, J.M.S. and Wang, X.C. (2010). Affordability, accessibility, and accountability: Perceived impacts of the Pre-primary Education Vouchers in Hong Kong. *Early Childhood Research Quarterly*, 25(1), 125-138.

Lieberman, A.F., Van Horn, P.J. & Ghosh Ippen, C. (2005). Toward evidence-based treatment: Child-Parent Psychotherapy with preschoolers exposed to marital violence. *Journal of the American Academy of Child and Adolescent Psychiatry*, 44(12), 1241-1248.

Lindfors, J.W. (2008). *Children's language: connecting reading, writing, and talk*. New York: Teachers College Press.

Linver, M.R., Brooks-Gunn, J. and Cabrera, N. (2004). The Home Observation for Measurement of the Environment (HOME): The derivation of conceptually designed subscales. *Parenting: Science and Practice*, 4, 99-114.

Lonigan, C.J. (2006). Development, Assessment, and Promotion of Preliteracy Skills. *Early Education and Development*, 17(1), 91-114.

Lonigan, C.J., McDowell, K.D. and Phillips, B.M. (2004). Standardized assessments of children's emergent literacy skills. In Wasik, B. (Ed.), *Handbook Family Literacy: Research and Services*, pp. 525-550, Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Lonigan, C.J., Wagner, R.K., Torgesen, J.K. and Rashotte, C. (2007). *Test of Preschool Early Literacy*. Austin, TX: PRO-ED.

Lonigan, C.J. and Wilson, S.B. (2008). *Report on the Revised Get Ready to Read! Screening tool: Psychometrics and normative information (Technical Report)*. New York, NY: National Center for Learning Disabilities.

Lutz, K.F., Anderson, L.S., Pridham, K.A., Riesch, S.K. and Becker, P.T. (2009). Furthering the understanding of parent-child relationships: A nursing scholarship review Series. Part 1 – Introduction. *Journal for Specialists in Pediatric Nursing*, 14(4), 256–261.

Maccoby, E.E. and Martin, J.A. (1983). Socialization in the context of the family: Parent-child interaction. In Mussen, P.H. (Ed.), *Child Psychology*, Vol.4, pp. 1-103, New York: Wiley.

MacKinnon D.P., Fairchild, A.J., Fritz, M.S. (2007). Mediation Analysis. *Annual Review of Psychology*, **58**, 593-614.

MacKinnon D.P., Lockwood, C.M., Hoffman, J.M., West, S.G. and Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects. *Psychological Methods*, **7**(1), 83-104.

Mantizicopoulos, P.Y. (1997). The relationship of family variables to Head Start children's preacademic competence. *Early Education and Development*, 8, 357-375.

Martini, F. and Senechal, M. (2012). Learning literacy skills at home: Parent teaching, expectations, and child interest. *Canadian Journal of Behavioural Science*, 44(3), 210-221.

Mason, J.M. (1980). When do children begin to read: an exploration of four year old children's letter and word reading competencies. *Reading Research Quarterly*, 15(2), 203-227.

Mason, J.M. (1992). Reading Stories to Preliterate Children: A Proposed Connection to Reading. In Gough, P.B., Ehri, L.C. and Treiman, R. (Eds.), *Reading acquisition*, pp. 215-242, Hillsdale, N.J.: L. Erlbaum Associate.

Mason, J.M., Stewart, J.P., Peterman, C.L. and Dunning, D. (1992). *Toward an integrated model of early reading development (Technical Report No. 566)*. Urbana-Champaign: Center for the Study of Reading.

Masse, L.N. and Barnett, W.S. (2002). *A Benefit Cost Analysis of the Abecedarian Early Childhood Intervention*. New Jersey: National Institute for Early Education Research.

Massetti, G.M. (2009). Enhancing emergent literacy skills of preschoolers from low-income environments through a classroom-based approach. *School Psychology Review*, 38(4), 554-569.

Maye, J., Werker, J.F. and Gerken, L. (2002). Infant sensitivity to distributional information can affect phonetic discrimination. *Cognition*, 82(3), B101-B111.

Meisels, S.J. (2006). *Accountability in early childhood: No easy answers*. Erikson Institute Occasional Paper No.6. Chicago: Herr Research Centers for Children and Social Policy at Erikson Institute.

Molfese, V.J., Modglin, A.A., Beswick, J.L., Neamon, J.D., Berg, S.A., Berg, C.J. and Molnar, A. (2006). Letter knowledge, phonological processing, and print knowledge: Skill development in non-reading preschool children. *Journal of Learning Disabilities*, 39, 296-305.

Molfese, V.J., Modglin, A.A., Walker, J. and Neamon, J. (2004). Screening early reading skills in preschool children: Get Ready to Read. *Journal of Psychoeducational Assessment*, 22, 136-150.

Morrison, F.J. and Cooney, R.R. (2002). Parenting and academic achievement: Multiple paths to early literacy. In Borkowski, J.G., Ramey, S.L. and Bristol-Power, M. (Eds.), *Parenting and the child's world: influences on academic, intellectual, and social-emotional development*, pp. 141-160, Mahwah, N.J.: Lawrence Erlbaum Associates.

Morris, D., Bloodgood, J.W., Lomax, R.G. and Perney, J. (2003). Developmental steps in learning to read: A longitudinal study in kindergarten and first grade. *Reading Research Quarterly*, 38, 302-328.

Morrison, F.J. (2009). Parenting and Academic Development. *Merrill-Palmer Quarterly*, July 55(3), 361-372.

Moshangen, M. and Musch, J. (2014). Sample size requirements of the robust weighted least squares estimator. *Methodology*, 10(2), 60-70.

Nagy, W.E. and Anderson, R.C. (1984). How many words are there in printed school English? *Reading Research Quarterly*, 19, 304-330.

National Center for Education Statistics (2013). *The Nation's Report Card – A First Look: 2013 Mathematics and Reading* (NCES 2014-451). Institute of Education Sciences, U.S. Department of Education, Washington, D.C.

National Center for Learning Disabilities (2009). *Get Ready to Read! – Revised: Early Literacy Manual*. Minneapolis, MN: NCS Pearson Assessments.

National Center for Learning Disabilities (2010). *Get Ready to Read! In Brief*. Retrieved on 25 June, 2010 from http://www.getreadytoread.org/index.php?option=com_content&task=view&id=86&Itemid=302

National Center for Learning Disabilities - HLEC (2010). *Get Ready to Read! Literacy Checklists*. Retrieved on 18 January, 2010 from http://www.getreadytoread.org/images/stories/downloads/home_checlist_rev.pdf

National Early Literacy Panel (2004). *The National Early Literacy Panel: A research synthesis on early literacy development.* Presentation to the National Association of Early Childhood Specialists, Anaheim, CA.

National Early Literacy Panel (2005). *Report on a synthesis of early predictors of reading*. Louisville, KY: Author.

National Early Literacy Panel (2008). *Developing Early Literacy: Report of the National Early Literacy Panel*. Washington, DC: National Institute for Literacy.

National Early Literacy Panel (2009) *Developing Early Literacy: Report of the National Early Literacy Panel*. Retrieved on 23 February, 2010 from http://www.nichd.nih.gov/publications/pubs/upload/NELPReport09.pdf.

National Institute of Child Health and Human Development (2000). *Report of the National Reading Panel: Teaching children to read*. Washington, DC: U.S. Department of Health and Human Services.

National Scientific Council on the Developing Child (2004). *Young Children Develop in an Environment of Relationships: Working Paper No. 1*. Retrieved from www.developingchild.harvard.edu.

National Scientific Council on the Developing Child (2007). *The Timing and Quality of Early Experiences Combine to shape Brain Architecture: Working Paper No. 5*. Retrieved from www.developingchild.harvard.edu.

National Scientific Council on the Developing Child (2010). *Early Experiences Can Alter Gene Expression and Affect Long-Term Development: Working Paper No. 10*. Retrieved from www.developingchild.harvard.edu.

Nelson, C.A. (2000). The developing brain. In Shonkoff, J.P. and Phillips, D.A. (Eds.), *From Neurons to Neighborhoods: The Science of Early Childhood Development*, pp. 182-217. Washington, D.C.: National Academy Press.

Neuman, S.B. (1996). Children engaging in storybook reading: The influence of access to print resources, opportunity, and parental interaction. *Early Childhood Research Quarterly*, 11, 495-513.

Neuman, S.B., Copple, C. and Bredekamp, S. (2000). *Learning to read and write: developmentally appropriate practices for young children*. Washington, DC: National Association for the Education of Young Children.

Neuman, S.B. and Gallagher, P. (1994). Joining together in literacy learning: Teenage mothers and children. *Reading Research Quarterly*, 29(4), 383-401.

Ng, M. and Chiu, A. (2010). Domestic helper guilty of feeding baby urine. *South China Morning Post*, September 8.

Nomaguchi, K.M., Milkie, M.A., and Bianchi, S.M.(2005). Time strains and psychological well-being: Do dual-earner mothers and fathers differ? *Journal of Family Issues*, 26, 756-792.

Oka, E. and Paris, S. (1986). Patterns of motivation and reading skills in underachieving children. In Ceci, S. (Ed.), *Handbook of cognitive, social, and neuropsychological aspects of learning disabilities*, Vol. 2, pp. 116-145, Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Pan, B.A., Rowe, M.L., Singer, J.D. and Snow, C.E. (2005). Maternal correlates of growth in toddler vocabulary production. *Child Development*, 76, 763-782.

Parke, R.D. and Buriel, R. (2006). Socialization in the family: Ethnic and ecological perspectives. In Eisenberg, N., Damon, W. and Lerner, R.M. (6th eds.), *Handbook of Child Psychology*, Vol.3, pp.429-504, NJ: John Wiley & Sons, Inc.

Payne, A.C., Whitehurst, G.J. and Angell, A.L. (1994). The role of home literacy environment in the development of language ability in preschool children from low-income families. *Early Childhood Research Quarterly*, 9, 427-440.

Phillips, B.M., Clancy-Menchetti, J. and Lonigan, C.J. (2008). Successful phonological awareness instruction with preschool children: Lessons from the classroom. *Topics in Early Childhood Special Education*, 28, 3-17.

Phillips, B.M., Lonigan, C.J. and Wyatt, M.A. (2009). Predictive Validity of the Get Ready to Read! Screener: Concurrent and long-term relations with reading-related skills. *Journal of Learning Disabilities*, 42(2), 133-147.

Pierson, H.D. (1992). Cantonese, English or Putonghua – Unresolved communicating issue in Hong Kong's future. In G.A. Postiglione (Ed.), *Education and Society in Hong Kong: Toward One Country and Two Systems*. Hong Kong: Hong Kong University Press.

Pollak, S.D., Cicchetti, D., Hornung, K., and Reed, A. (2000). Recognizing emotion in faces: Developmental effects of child abuse and neglect. *Developmental Psychology*, 36(5), 679-688.

Population Census: Main Report 2001 – Volume I, Census and Statistics Department, HKSAR.

Presser, H.B. (2003). *Working in a 24/7 economy*. New York: Russell Sage Foundation.

Purcell-Gates, V. (1996). Stories, coupons, and the TV guide: relationships between home literacy experiences and emergent literacy knowledge. *Reading Research Quarterly*, 31(3), 406-428.

Purcell-Gates, V. (2000). Family literacy. In Kamil, M.L., Mosenthal, P.B., Pearson, P.D. and Barr, R. (Eds.), *Handbook of reading research*, Vol.3, pp. 853-870. Mahwah, NJ: Erlbaum.

Quiroga, A.M. (1992) *Studies of the polychoric correlation and other correlation measures for ordinal variables*. Unpublished doctoral dissertation, Uppsala University.

Radke-Yarrow, M., Richters, J. and Wilson, W.E. (1988). Child development in a network of relationships. In Hinde, R.A. and Stevenson-Hinde, J. (Eds.), *Relationships within families: Mutual influences*, pp. 48-67, Oxford: Clarendon.

Ramirez-Esparza, N., Garcia-Sierra, A. and Kuhl, P.K. (2014). Look who's talking: Speech style and social context in language input to infants are linked to concurrent and future speech development. *Developmental Science*, 17, 1-12. DOI: 10.1111/desc. 12172.

Rao, N. and Li, H. (2009). Quality matters: early childhood education policy in Hong Kong. *Early Child Development and Care*, 179(3), 233-245.

Raykov, T., Shrout, P.E. (2002). Reliability of scales with general structure: Point and interval estimation using a structural equation modeling approach. *Structural Equation Modeling*, 9, 195-212.

Reese, E. (1995). Predicting children's literacy from mother child conversations. *Cognitive Development*, 10(3), 381-405.

Richgels, D.J. (2001). Invented spelling, phonemic awareness, and reading and writing instruction. In Neuman, S.B. and Dickinson, D. (Eds.), *Handbook of early literacy research*, Vol.1, pp.142-155, New York: Guilford Press.

Roberts, J., Jurgens, J. and Burchinal, M. (2005). The role of home literacy practices in preschool children's language and emergent literacy skills. *Journal of Speech, Language, and Hearing Research*, 48, 345-359.

Rodriguez, E.T., Tamis-LeMonda, C.S., Spellmann, M.E., Pan, B.A., Raikes, H., Lugo-Gil, J. and Luze, G. (2009). The formative role of home literacy experiences across the first three years of life in children from low-income families. *Journal of Applied Developmental Psychology*, 30, 677-694.

Saffran, J.R. (2003). Statistical language learning: Mechanisms and constraints. *Current Directions in Psychological Science*, 12(4), 110-114.

Scarborough, H.S. (1998a). Early identification of children at risk for reading difficulties: Phonological awareness and some other promising predictors. In Shapiro, B.K., Accardo, P.J. and Capute, A.J. (Eds.), *Specific reading disability: A view of the spectrum*, pp. 75-199, Timonium, MD: York Press.

Scarborough, H.S. (1998b). Predicting the future achievement of second graders with reading disabilities: Contributions of phonemic awareness, verbal memory, rapid naming and IQ. *Annals of Dyslexia*, 48, 115-136.

Scarborough, H.S. (2001). Connecting early language and literacy to later reading (dis)abilities: Evidence, theory, and practice. In Neuman, S.B. and Dickinson, D.K. (Eds.), *Handbook of early literacy research*, pp. 97-110, New York: Guilford.

Scarborough, H.S. and Dobrich, W. (1994). On the efficacy of reading to preschoolers. *Developmental Review*, 14, 245-302.

Schaefer, B., Fricke, S., Szczerbinski, M., Fox-Boyer, A.V., Stackhouse, J. and Wells, B. (2009). Development of a test battery for assessing phonological awareness in German-speaking children. *Clinical Linguistics and Phonetics*, 23(6), 404-430.

Schuele, C.M., Skibbe, L.E. and Rao, P.K.S. (2007) Assessing phonological awareness. In Pence, K.L. (Eds.), *Assessment in emergent literacy: A volume in the emergent and early literacy series*, pp. 275-325, San Diego, CA: Plural Publishing, Inc.

Senechal, M. (2006). Testing the home literacy model: Parental involvement in kindergarten is differentially related to Grade 4 reading comprehension, fluency, spelling, and reading for pleasure. *Scientific Studies of Reading*, 10, 59-87.

Senechal, M., Cornell, E.H. and Broda, L.S. (1995). Age-related changes in the organization of parent-infant interactions during picture-book reading. *Early Childhood Research Quarterly*, 10, 317-337.

Senechal, M. and LeFevre, J. (2001). Storybook reading and parent teaching: Links to language and literacy development. In Rebello-Britto, P. and Brooks-Gunn, J. (Eds.), *The role of family literacy environments in promoting young children's emergent literacy skills*, pp. 53-71, New York: Jossey-Bass.

Senechal, M. and LeFevre, J.A. (2002). Parental involvement in the development of children's reading skill: A 5-year longitudinal study. *Child Development*, 73, 445-460.

Senechal, M. and LeFevre, J.A. (2014). Continuity and change in the home literacy environment as predictors of growth in vocabulary and reading. *Child Development*, 85(4), 1552-1568.

Senechal, M., LeFevre, J., Hudson, E. and Lawson, P. (1996). Knowledge of storybooks as a predictor of young children's vocabulary. *Journal of Educational Psychology*, 88, 520-536.

Senechal, M., LeFevre, J.A., Smith-Chant, B.L. and Colton, K. (2001). On refining theoretical models of emergent literacy: The role of empirical evidence. *Journal of School Psychology*, 39, 439-460.

Senechal, M., LeFevre J.A., Thomas, E.M. and Daley, K.E. (1998) Differential Effects of Home Literacy Experiences on the Development of Oral and Written Language. *Reading Research Quarterly*, 33(1), 96-116.

Senechal, M. and Young, L. (2008). The effect of family literacy interventions on children's acquisition of reading from kindergarten to Grade 3: A meta-analytic review. *Review of Educational Research*, 78, 880-907.

Serpell, R., Baker, L. and Sonnenschein, S. (2005). *Becoming literate in the city: The Baltimore Early Childhood Project*. Cambridge, England: Cambridge University Press.

Shapiro, J., Anderson, J. and Anderson, A. (1997). Diversity in parental storybook reading. *Early Child Development and Care*, Vol. 127-128, 47-59.

Sharkness, J. and DeAngelo, L. (2011). Measuring student involvement: A comparison of Classical Test Theory and Item Response Theory in the construction of scales from student surveys. *Research in Higher Education*, 52(5), 480-507.

Shek, D.T.L. (1996). Hong Kong parents' attitudes about marital quality and children. *Journal of Genetic Psychology*, 157, 123-135.

Shonkoff, J.P., Garner, A.S., The Committee on Psychosocial Aspects of Child and Family Health, Committee on Early Childhood, Adoption, and Dependent Care, and Section on Developmental and Behavioral Pediatrics (2012). The lifelong effects of early childhood adversity and toxic stress. *Journal of The American Academy of Pediatrics*, 129(1), 232-246.

Sigel, I.E. (1982). The relationship between parental distancing strategies and the child's cognitive behavior. In Laosa, L.M. and Sigel, I.E. (Eds.), *Families as learning environments for children*, pp. 47-86, New York: Plenum.

Sigel, I.E., Stinson, E.T. and Flaugher, J. (1991). Socialization of representational competence in the family: The distancing paradigm. In Sternberg, R.J. and Okagaki, L. (Eds.), *Directors of development: Influences on the development of children's thinking*, pp. 121-144, Hillsdale, NJ: Lawrence Erlbaum.

Silvern, S. (1985). Parent involvement and reading achievement: A review of research and implications for practice. *Childhood Education*, 62(1), 46-50.

Sim, S. and Berthelsen, D. (2014). Shared book reading by parents with young children: Evidence-based practice. *Australian Journal of Early Childhood*, 39(1), 50-55.

Simsek, G.G. and Noyan, F. (2012) Structural equation modeling with ordinal variables: a large sample case study. *Quality and Quantity*, 46, 1571-1581.

Skwarchuk, S.L., Sowinski, C., and LeFevre, J.A. (2014). Formal and informal home learning activities in relation to children's early numeracy and literacy skills: The development of a home numeracy model. *Journal of Experimental Child Psychology*, 121, 63-84.

Smolkin, L.B. and Yaden, D.B. (1992). "O" is for "Mouse": First encounters with the alphabet book. *Language Arts*, 69, 432-441.

Snow, C.E. (1983). Literacy and Language: Relationships during the preschool years. *Harvard Educational Review*, 53, 165-189.

Snow, C.E., Burns, M.S. and Griffins, P. (1998). *Preventing reading difficulties in young children*. Washington, DC: National Academy Press.

So, D.W.C. (1992). Language-based bifurcation of secondary schools in Hong Kong. In Luke, K.K. (Ed.), *Into 21st Century: Issues of Language in Education in Hong Kong*. Hong Kong: Linguistic Society of Hong Kong.

Sonnenschein, S., Brody, G. and Munsterman, K. (1996). The influence of family beliefs and practices on children's early reading development. In Baker, L. and Afflerbach, P. (Eds.), *Developing engaged readers in school and home communities*, pp. 3-20, Mahwah, NJ: Lawrence Erbaum Associates, Inc.

Spencer, E.J., Spencer, T.D., Goldstein, H., and Schneider, N. (2013). Identifying early literacy learning needs: Implications for child outcome standards and assessment systems. In Shanahan, T. and Lonigan, C.J. (Eds.), *Early childhood literacy: The National Early Literacy Panel and Beyond*, pp. 45-70, Baltimore, MD: Brookes Publishing.

Stackhouse, J. and Wells, B. (1997). *Children's speech and literacy difficulties 1: A psycholinguistic framework*. London: Whurr Publishers.

Standing Committee on Language Education and Research (2003). *Action Plan to Raise Language Standards in Hong Kong: Final Review Report*. Hong Kong: Government Printer.

Stanovich, K.E. (1986). Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly*, 21, 360–407.

Steenkamp, J.E.M. and van Trijp, H.C.M. (1991). The use of LISREL in validating marketing constructs. *International Journal of Research in Marketing*, 8(4), 283-299.

Stevenson, J. and Fredman, G. (1990). The social environment correlates of reading ability. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, July, 31(5), 681-698.

Stevenson, H.W. and Newman, R.S. (1986). Long-term prediction of achievement and attitudes in mathematics and reading. *Child Development*, 57, 646-659.

Stephenson, K.A., Parrila, R.K. and Georgiou, G.K. (2008). Effects of home literacy, parents' beliefs, and children's task-focused behavior on emergent literacy and word reading skills. *Scientific Studies of Reading*, 12, 24-50.

Stipek, D., Milburn, S., Clements, D. and Daniels, D.H. (1992). Parents' beliefs about appropriate education for young children. *Journal of Applied Developmental Psychology*, 13, 293-310.

Storch, S.A. and Whitehurst, G.J. (2001). The role of family and home in the literacy development of children from low-income backgrounds. *New Directions for Child and Adolescent Development*, 92, 53-72.

Storch, S.A. and Whitehurst, G.J. (2002). Oral language and code-related precursors to reading: Evidence from a longitudinal structural model. *Developmental Psychology*, 38, 934-947.

Strickland, D.S. (1990). Emergent Literacy: How Young Children Learn to Read and Write. *Educational Leadership*, March, 47(6), 18-23.

Stickland, D.S. (2001). Early intervention for African American children considered to be at risk. In Neuman, S.B. and Dickinson, D. (Eds.), *Handbook of early literacy research*, Vol.1, pp. 322-332, New York: Guilford.

Sulzby E. (1986). Writing and reading: Signs of oral and written language organization in the young child. In Teale, W.H. and Sulzby E. (Eds.), *Emergent literacy: writing and reading*. pp. 50-89, Norwood, NJ: Ablex Publication Corp.

Sulzby, E. and Teale, W. (1991). Emergent literacy. In Barr, R., Kamil, M., Mosenthal, P. and Pearson, P.D. (Eds.), *Handbook of reading research*, Vol.2, pp. 727-758, New York: Longman.

Sutton, M.M., Sofka, A.E., Bojczyk, K.E. and Curenton, S.M. (2007). Assessing the quality of storybook reading. In Pence, K.L. (Ed.), *Assessment in emergent literacy: A volume in the emergent and early literacy series*, pp. 327-375, San Diego, CA: Plural Publishing, Inc.

Tabors, P.O. and Snow, C.E. (2001). Young bilingual children and early literacy development. In Neuman, S.B. and Dickinson, D.K. (Eds.), *Handbook of early literacy research*, Vol.1, pp. 159-178, New York: Guilford Press.

Teale, W.H. (1986). Home background and young children's literacy development. In Teale, W.H. and Sulzby E. (Eds.), *Emergent literacy: writing and reading*. pp. 173-206, Norwood, NJ: Ablex Publication Corp.

Teale, W.H. and Sulzby, E. (1986). *Emergent literacy: writing and reading*. Norwood, N.J.: Ablex Publication Corp.

Teale, W.H. and Sulzby, E. (1987). Literacy acquisition in early childhood: The roles of access and mediation in storybook reading. In Wagner, D.A. (Ed.), *The future of literacy in a changing world*, pp. 111-130, New York: Pergamon Press.

Tolchinsky-Landsmann, L. (2003). *The cradle of culture*. Mahwah, NJ: Erlbaum.

Tomopoulos, S., Dreyer, B.P., Tamis-LeMonda, C., Flynn, V., Tineo, W. (2006). Books, toys, parent-child interaction, and development in young Latino children. *Ambulatory Pediatrics*, 6, 72-78.

Torgesen, J.K. (2000). Individual differences in response to early interventions in reading: The lingering problem of treatment resisters. *Learning Disabilities Research and Practice*, 15, 55-64.

Torgesen, J.K., and Burgess, S.R. (1998). Consistency of reading-related phonological processes throughout early childhood: Evidence from longitudinal-correlational and instructional studies. In Metsala, J.L. and Ehri, L.C. (Eds.), *Word recognition in beginning literacy*, pp. 161-188, Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Torgesen, J. and Mathes, P. (2000). *A basic guide to understanding, assessing, and teaching phonological awareness*. Austin, TX: Pro-Ed.

Torgesen, J.K., Rashotte, C.A. and Alexander, A. (2001). Principles of fluency instruction in reading: Relationships with established empirical outcomes. In Wolf, M. (Eds.), *Dyslexia, fluency, and the brain*, 333-355, Parkton, MD: York Press.

Torgesen, J.K., Wagner, R.K., Rashotte, C.A., Alexander, A. and Conroy, T. (1997). Preventive and remedial interventions for children with severe reading disabilities. *Learning Disabilities: An Interdisciplinary Journal*, 8, 51-62.

Tracy, D.H. and Young, J.W. (2002). Mothers' helping behaviors during children's at-home oral-reading practice: Effects on children's reading ability, children's gender, and mother's educational level. *Journal of Educational Psychology*, 94, 729-737.

Trask, R.L. (2007). *Language and Linguistics: The Key Concepts (2nd ed.)*. New York: Routledge.

Treiman, R. and Broderick, V. (1998). What's in a name: Children's knowledge about the letters in their own names. *Journal of Experimental Psychology*, 70, 97-116.

Treiman, R., Tincoff, R., Rodriguez, K., Mouzaki, A., and Francis, D.J. (1998). The foundations of literacy: Learning the sounds of letters. *Child Development*, 69, 1524-1540.

Treiman, R. and Zukowski, A. (1996). Children's sensitivity to syllables, onsets, rimes, and phonemes. *Journal of Experimental Child Psychology*, 61, 193-215.

Trevarthen, C. (1977). Descriptive analyses of infant communicative behaviour. In Schaffer, H.R. (Ed.), *Studies in mother-infant interaction: Proceedings of the Loch Lomond Symposium*, Ross Priory, University of Strathclyde, pp. 227-270, London: Academic Press.

Umberson, D. (1989). Relationships with children: Explaining parents' psychological well-being. *Journal of Marriage and the Family*, 51, 999-1012.

Umek, L.M., Podlesek, A. and Fekonja, U. (2005). Assessing the home literacy environment: Relationships to child language comprehension and expression. *European Journal of Psychological Assessment*, 21, 271-281.

van Kleeck, A., Stahl, S.A. and Bauer, E.B. (2003). *On reading books to children: Parents and Teachers*. Mahwah, N.J.: L. Erbaum Associates.

Ventura, A. and Jang, S. (2010). Private tutoring through the internet: Globalization and offshoring. *Asia Pacific Education Review*, 11(1), 59-68.

Vygotsky, L.S. (1962). *Thought and language*. Cambridge, MA: MIT Press.

Vygotsky, L.S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge: Harvard University Press.

Vygotsky, L.S. (1986). *Thought and Language*. Cambridge: Harvard University Press.

Wachs, T.D. and Gruen, G.E. (1982). *Early experience and human development*. New York: Plenum Press.

Wagner, R.K., Torgesen, J.K. and Rashotte, C.A. (1994). Development of reading-related phonological processing abilities: New evidence of bidirectional causality from a latent variable longitudinal study. *Developmental Psychology*, 30, 73-87.

Walberg, H.J. and Tsai, S. (1983). Matthew effects in education. *American Educational Research Journal*, 20, 359-373.

Wasik, B.A. and Bond, M.A. (2001). Beyond the pages of a book: Interactive book reading and language development in preschool classrooms. *Journal of Educational Psychology*, 93(2), 243-250.

Wells, R. (1985). *Max's bedtime*. New York: Dial Books for Young Readers.

Westby, C. (1991). Assessing and remediating text comprehension problems. In Kahmi, A.G. and Catts, H. (Eds.), *Reading disabilities: A developmental language perspective*, pp. 199-260, Needham Heights, MA: Allyn and Bacon.

Whitehurst, G.J. (1993). *Stony Brook Family Reading Survey*. Stony Brook, NY: Author.

Whitehurst, G.J. (2001). *Get Ready to Read! (GRTR!) screen technical report*. New York: The National Center for Learning Disabilities.

Whitehurst, G.J., Arnold, D.H., Epstein, J.N., Angell, A.L., Smith, M. and Fischel, J.E. (1994). A picture book reading intervention in daycare and home for children from low-income families. *Developmental Psychology*, 30, 679-689.

Whitehurst, G.J. Falco, F.L. Lonigan, C.J., Fischel, J.E., DeBaryshe, B.D., ValdezMenchaca, M.C. and Caulfield, M. (1988). Accelerating language development through picture book reading. *Developmental Psychology*, 24(4), 552-559.

Whitehurst, G.J. and Lonigan, C.J. (1998). Child Development and Emergent Literacy. *Child Development*, June, 69(3), 848-872.

Whitehurst, G.J. and Lonigan, C.J. (2001). Emergent Literacy: Development from Prereaders to Readers. In Dickinson, D.K. and Neuman, S.B. (Eds.), *Handbook of Early Literacy Research,* pp. 11-29, New York: The Guilford Press.

Wilson, S.B. and Lonigan, C.J. (2009). An evaluation of two emergent literacy screening tools for preschool children. *Annals of Dyslexia*, 59(2), 115-131.

Yeo, L.S., Ong, W.W. and Ng, C.M. (2014). The Home Literacy Environment and Preschool Children's Reading Skills and Interest. *Early Education and Development*, 25(6), 791-814.

Zeece, P.D. (1996). Alphabet and counting book. *Early Childhood Education Journal*, 23, 159-162.

Zevenbergen, A.A. and Whitehurst, G.J. (2003). Dialogic reading: A shared picture book reading intervention for preschoolers. In van Keeck, A., Stahl, S.A. and Bauer, E.B. (Eds.), *On reading books to children: Parents and teachers*. Mahwah, NJ: Lawrence Erlbaum Associates.

Zucker, T.A. and Grant, S.L. (2007). Assessing home supports for literacy. In Pence, K.L. (Eds.), *Assessment in emergent literacy: A volume in the emergent and early literacy series*, pp. 327-375, San Diego, CA: Plural Publishing, Inc.

Appendix A: Research letter of invitation to principals of kindergartens

Principal
ESF International Kindergarten, Tsing Yi.

Dear Principal,

I am writing to request your help in a research study that concerns early childhood literacy development in Hong Kong. I am a Programme Director at the School of Professional and Continuing Education at the University of Hong Kong and this study will be the basis for a doctorate thesis to be submitted to the University of Durham in the United Kingdom.

The research aims to examine the *development and acquisition of early reading and writing skills* among preschool children in Hong Kong. This study has been reviewed and approved by the School of Education at the University of Durham in the United Kingdom.

I would like to invite ESF International Kindergarten (Tsing Yi) to participate in this research study. If you kindly consent to participate in this study, pupils whose birthday range from April 1 to October 1, 2007 inclusively will be invited to take part in a well-developed literacy test and their parents will be requested to complete a standard questionnaire. My assistants and I hope to gather necessary data through the following three steps:

(1) send standard QUESTIONNAIRES "Early Childhood Literacy Development Questionnaire" to *a limited number* of the children's PARENTS in ESF International Kindergarten (Tsing Yi) for the parents to complete and return the questionnaires to me (about 20 minutes to complete a questionnaire) by using stamped return envelopes provided;

(2) conduct a LITERACY TEST with each selected CHILD (about 15 minutes to complete a test) in ESF International Kindergarten (Tsing Yi) after receiving parents' informed consent; and

(3) interview a few parents (about 15 minutes to complete an interview) in ESF International Kindergarten (Tsing Yi) after the completion of the literacy tests.

Please be assured that *all the information collected in this research study will be kept strictly confidential and all research results will remain anonymous.* For each child who takes part in the literacy test, we will formally obtain parents' consent with a "Research Participant Consent Form".

The early childhood literacy development is an important and ongoing field of research in education. Your participation will not only facilitate this research study, but also add pertinent research information for educators in Hong Kong. The research findings might be of interest to you and participating parents. As a way of saying "Thank you", I will send you the following at the completion of the study: (i) the test report on early literacy development for your kindergarten; and (ii) a brief report of the research findings and conclusions made from this study. For their interest, each participating parent will receive a copy of their child's literacy test results.

I would like to call you next Thursday for your response, which I sincerely hope will be favourable. Should you have any questions before then, please feel free to call (9870-4878) or email me (chun.ngai@durham.ac.uk). I will also be glad to answer any questions that you may have when I call. I hope to send the standard questionnaires to participating parents around the 4th week of May.

Yours sincerely,

Chun Ngai (EdD Candidate)
School of Education, University of Durham

Appendix B: Research letter of participation to parents of preschool children

Dear Parents,

I am writing to request your help in a research study that concerns early childhood literacy development in Hong Kong. Many parents would like to help their children learn to read and write as early as possible because it can provide a strong foundation for academic motivation and performance in their future formal schooling. Therefore, it is important for their life-long prospects.

The research aims to examine the *development and acquisition of early reading and writing skills* among preschool children in Hong Kong. This study has been reviewed and approved by the School of Education at the University of Durham in the United Kingdom.

In order to obtain a representative sample of the study population, you are one of a small number of PARENTS who are invited to participate in Stage 1 of this study. If you kindly consent to participate,

> I would like to seek your assistance to complete and return the enclosed standard **QUESTIONNAIRE** to us (about 20 minutes to complete the questionnaire) by using the stamped return envelope provided.

In Stage 2, your CHILD may have an opportunity to participate in a well-developed LITERACY TEST (about 15 minutes to complete the test) to be conducted in the kindergarten.

> I would like to seek your assistance to complete and return the **REPLY SLIP** below to us together with the completed questionnaire by using the same stamped return envelope.

Please be assured that *all the information collected will be kept strictly confidential and all research results will remain anonymous*. If your child can have the opportunity to take part in the literacy test, the result may be of interest to you. As a way of saying "Thank you", I will send you a copy of your child's literacy test result at the completion of this study.

I hope you enjoy completing the questionnaire and look forward to receiving both your completed QUESTIONNAIRE and REPLY SLIP on or before **3 June, 2011**. Should you have any questions, please feel free to call (9870-4878) or email me (chun.ngai@durham.ac.uk).

Yours sincerely,

Chun Ngai (EdD Candidate)
School of Education, University of Durham

✂

Research Participant Consent Form – REPLY SLIP

The Child's Name: ________________ The Child's Birthday: ___ / ___ / ______

Family Name Given Name DD / MM / YYYY

I agree / disagree* that my child will participate in the **LITERACY TEST** when it is arranged in the kindergarten.

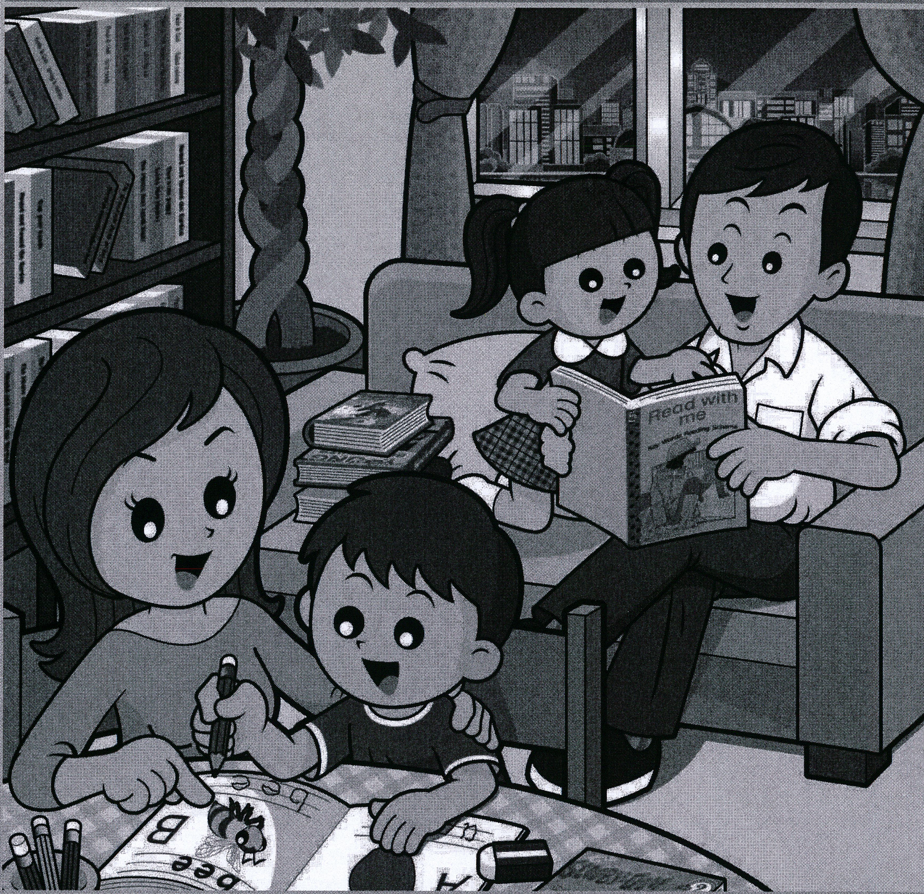
* Delete as appropriate

Name of Parent (Print)	Signature of Parent	Date

Appendix C: The standard questionnaire for parents

Early Childhood Literacy Development Questionnaire

A study to understand issues important to the development of preschool children's reading and writing skills at home



School of Education • University of Durham, UK

Date of Completing this Questionnaire: / /

DD / MM / YYYY

Researcher Use Only: **Child Code** **Response Code**

Directions

(1) In this standard questionnaire, "**the Child**" in the questions is your child as named below. He or she must be in the age ranging from 3-year-9-month to 4-year-3-month at the time of this research assessment.

(2) This questionnaire must be completed by a **biological parent** of the Child (either the Child's father or the Child's mother) who is living together with the Child and this PARENT must be the person who most frequently takes care of the Child at home.

(3) All the questions in this questionnaire refer ONLY to **English** language literacy interactions and English resources (or materials) AT HOME.

(4) Your responses can increase our understanding of issues important to the development of preschool children's reading and writing skills at home. Thus, it is important for us that you can answer ALL the questions in this questionnaire **honestly** and that there are NO MISSING DATA and/or NO INCONSISTENT ANSWERS in this returned questionnaire. *Please be assured that all the information collected in this study will be kept strictly confidential and all research results will remain anonymous.*

NOTE

Your child may have an opportunity to participate in the limited number of LITERACY TESTS to be conducted in your child's kindergarten when the following TWO CRITERIA are fulfilled:

(1) **Parents' informed consent** indicated in the returned REPLY SLIP; and
(2) **First come, first served** based on the postal date of this returned QUESTIONNAIRE.

Section A: The Child's Particulars

Please provide the Child's particulars as listed below:

The Child's Name: ____________ **Sex:** Male / Female

Family Name Given Name — Delete as appropriate

Place of Birth: ____________

e.g. Hong Kong or Canada etc., please specify.

Birthday: / /

DD / MM / YYYY

Ethnicity: ____________

e.g. Chinese or Japanese etc., please specify.

Your relationship to the Child: Father-Child / Mother-Child

Delete as appropriate

Your Email-address: ____________ **Your phone no.:** ____________

Are you the biological parent of the Child?

○ Yes

○ No, Please specify: ____________

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In this standard questionnaire, there is no single right or wrong answer to each question. Please report your answer to each question that <u>best</u> describes you, the Child's behaviors at home and your family profile.

Section B: Early Childhood Literacy Development

1. To what extent do you agree or disagree with this statement: "<u>Preschool</u> period is an important time for developing children's English reading and writing skills."?

- ◯ Strongly agree
- ◯ Somewhat agree
- ◯ Neither agree nor disagree
- ◯ Somewhat disagree
- ◯ Strongly disagree

2. To what extent do you agree or disagree with this statement: "During the preschool period, <u>parents</u> play an important role in helping the development of children's English reading and writing skills at home."?

- ◯ Strongly agree
- ◯ Somewhat agree
- ◯ Neither agree nor disagree
- ◯ Somewhat disagree
- ◯ Strongly disagree

Section C: Home Literacy Environment

3. How many English Non-print materials for the Child (e.g. AV and Digital materials such as Baby Einstein DVD and other CD-ROMs etc.) are available in your home to help the Child learn English? Please count only the number of <u>English Non-print materials for the Child</u>. *(If it is a set of DVD series with 6 DVDs, it should be counted as 6 numbers of English Non-print materials).*

☐ Number of English Non-print materials for the Child

4. How many English picture-books for the Child (e.g. Old MacDonald and My First ABC Board Book etc.) are available in your home? Please count only the number of <u>English picture-books for the Child</u>.

☐ Number of English picture-books for the Child

5. **Other than books, how many other children items in your home with English print (e.g. wall charts, flash cards and games etc.) may be used to help the Child learn English? Please count only the number of children items with English print.**

☐ Number of children items with English print

6. **In an average week, how many times do YOU (including your SPOUSE) read English print materials (e.g. English newspapers, English magazines and English books etc.) AT HOME?**

☐ Time(s) per week

7. **In the occasions specified in Question 6 above, how many times does the Child see you (including your spouse) reading English print materials AT HOME?**

☐ Time(s) per week

8. **In an average week, how many NIGHT(s) do you (including your spouse) read English books to the Child at bedtime?**

☐ Night(s) per week (0 – 7)

9. **In an average week, how many times do you (including your spouse) read English books to the Child at other times?**

☐ Time(s) per week

10. **In an average week, how many times does the Child ask you (including your spouse) to read English books with him or her?**

☐ Time(s) per week

11. **In an average MONTH, how many times does the Child go to libraries (including kindergarten libraries and/or public libraries) to borrow English books?**

☐ Time(s) per Month

12. How old was the Child when you or your spouse STARTED reading English books to him or her? Please report only the age in MONTH(s) when the Child was first read to in English since birth.

☐ Month(s)

13. In an average week, how many times do you (including your spouse) teach the Child the letters' names (e.g. A, B, C ...) and/or letters' sounds (e.g. "C" = /k/) of the English alphabet?

☐ Time(s) per week

14. In an average week, how many times do you (including your spouse) teach the Child how to read English words (e.g. shovel, painting, ankle...)?

☐ Time(s) per week

15. In an average week, how many times do you (including your spouse) teach the Child how to write English letters (e.g. A, B, C ...) and/or English words?

☐ Time(s) per week

Section D: Parent-Child Relationship Quality

16. How satisfying or dissatisfying do you find being a parent is?

○ Very satisfying
○ Moderately satisfying
○ Slightly satisfying
○ Neutral
○ Slightly dissatisfying
○ Moderately dissatisfying
○ Very dissatisfying

○ Don't know
○ Not sure

17. How happy or unhappy are you with the way the Child behaves?

- ◯ Very happy
- ◯ Moderately happy
- ◯ Slightly happy
- ◯ Neutral
- ◯ Slightly unhappy
- ◯ Moderately unhappy
- ◯ Very unhappy

- ◯ Don't know
- ◯ Not sure

18. Overall, how well or unwell would you say you get along with the Child?

- ◯ Very well
- ◯ Moderately well
- ◯ Slightly well
- ◯ Neutral
- ◯ Slightly unwell
- ◯ Moderately unwell
- ◯ Very unwell

- ◯ Don't know
- ◯ Not sure

19. Overall, how enjoyable or unenjoyable are you with being a parent of the Child?

- ◯ Very enjoyable
- ◯ Moderately enjoyable
- ◯ Slightly enjoyable
- ◯ Neutral
- ◯ Slightly unenjoyable
- ◯ Moderately unenjoyable
- ◯ Very unenjoyable

- ◯ Don't know
- ◯ Not sure

20. Overall, how would you rate the quality of your relationship with the Child?

- ◯ Very good
- ◯ Moderately good
- ◯ Slightly good
- ◯ Fair
- ◯ Slightly poor
- ◯ Moderately poor
- ◯ Very poor

- ◯ Don't know
- ◯ Not sure

21. How satisfied or dissatisfied are you with your relationship to the Child?

- ◯ Very satisfied
- ◯ Moderately satisfied
- ◯ Slightly satisfied
- ◯ Neutral
- ◯ Slightly dissatisfied
- ◯ Moderately dissatisfied
- ◯ Very dissatisfied

- ◯ Don't know
- ◯ Not sure

Section E: The Child's Family Background

22. The parents' particulars *(For single-parent family, please mark* ⊗ Not Applicable *and you may leave the spouse's particulars blank in Q22, 23 & 24 inclusively).*

My Particulars	Spouse's Particulars
	◯ Not Applicable
a. What is your birth year?	
☐ My birth year (YYYY)	☐ Spouse's birth year (YYYY)
b. What is your ethnicity?	
☐ My ethnicity e.g. Chinese or Japanese etc., please specify.	☐ Spouse's ethnicity e.g. Chinese or Japanese etc., please specify.
c. What is the usual language at home?	
☐ My usual language e.g. Cantonese, Putonghua or English etc., please specify.	☐ Spouse's usual language e.g. Cantonese, Putonghua or English etc., please specify.
d. How many language(s) do you speak?	
☐ Number of language(s) spoken	☐ Number of language(s) spoken

23. What is your highest educational attainment? Please select only the highest educational level.

My highest education	Spouse's highest education
◯ Bachelor's degree	◯ Bachelor's degree
◯ Doctorate or above	◯ Doctorate or above
◯ Postgraduate (PgDip. or Master's)	◯ Postgraduate (PgDip. or Master's)
◯ Secondary School (F.7 or below)	◯ Secondary School (F.7 or below)
◯ Sub-degree (e.g. Higher Dip.)	◯ Sub-degree (e.g. Higher Dip.)
◯ Others, please specify:	◯ Others, please specify:

24. What is your current occupation? Please select only one current occupation.

My current occupation	Spouse's current occupation
◯ Clerks	◯ Clerks
◯ Craft and related workers	◯ Craft and related workers
◯ Full-time Homemakers	◯ Full-time Homemakers
◯ Machine operators / assemblers	◯ Machine operators / assemblers
◯ Managers & Administrators	◯ Managers & Administrators
◯ Professionals	◯ Professionals
◯ Service & shop sales	◯ Service & shop sales
◯ Others, please specify:	◯ Others, please specify:

25. The present home environment of the Child:

a. What type of housing are you living in with the Child?

Type of housing

e.g. Public, Privately-owned or Private-rental etc., please specify.

b. How many family members are living together with the Child? Please include the parents and the Child.

Number of family members

c. How many domestic helpers are living together with the Child?

Number of domestic helpers

26. **What are the following particulars of all the family members living together with the Child AT HOME? Please exclude the parents and the Child in the table below.**
(If there are more than 2 siblings or 2 adults living together with the Child in your home, please use the additional space below to provide the details.)

Relations to the Child (e.g. Younger brother and Grandmother etc.)		Age (Years)	Language(s) spoken at home: Cantonese	Putonghua	English	Others, please specify
Sibling 1			○	○	○	
Sibling 2			○	○	○	
Adult 1			○	○	○	
Adult 2			○	○	○	

27. **Your answer to this question is very important for us to understand the development of the Child's reading and writing skills at home. What do you think are the major difficulties (or problems) in helping the Child learn English reading and writing skills in your home environment?**

Thank you very much for completing this questionnaire!

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If you have any additional thoughts about any of the above topics or the questionnaire itself, please share with us here.

Please put the following **TWO** items into the ***stamped return envelope*** provided:

☑ This completed QUESTIONNAIRE;

☑ The signed REPLY SLIP of the Research Participant Consent Form.

And send them to the following address on or before

NGAI CHUN
P.O. Box No. 98929
TSIM SHA TSUI POST OFFICE

Appendix D: GRTR!-Revised: Standardized Answer Sheet

ANSWER SHEET

Get Ready to Read! REVISED

Instructions:

Read each question to the child word-for-word as it is written in the Screening Tool. The correct answer for each item is framed in the Screening Tool. On this Answer Sheet, mark the child's score for each item. Circle 1 for a correct response or 0 for an incorrect response. When the child has finished taking the Screening Tool, there should be a score (1 or 0) for each of the 25 items.

Count the number of correct responses made by the child. (Don't count the sample question.) Enter that number in the box labeled Number Correct. Refer to the reverse side of this Answer Sheet for instructions on how to find the child's Step score and Performance Level.

Item Number	Description	Score (circle)	
sample	car		
1.	back of book	1	0
2.	letters (A B C)	1	0
3.	letters (B D)	1	0
4.	word	1	0
5.	name of cereal	1	0
6.	letter R	1	0
7.	letter G	1	0
8.	letter that makes /s/ sound	1	0
9.	letter that makes /t/ sound	1	0
10.	letter that makes /b/ sound	1	0
11.	letter written best	1	0
12.	name written best	1	0
13.	longest story	1	0
14.	word that starts with /b/ sound	1	0
15.	word that starts with /d/ sound	1	0
16.	rhymes with ball	1	0
17.	sea + shell	1	0
18.	pen + guin	1	0
19.	mmm + oon	1	0
20.	rhymes with arm	1	0
21.	rhymes with hat	1	0
22.	numbers	1	0
23.	two words	1	0
24.	word written best	1	0
25.	scar without /s/	1	0
	Number Correct:		

Information about the child being screened

Child's Name: ______________________

Child's Sex: ☐ Female ☐ Male

Child's Age: Years ________ Months ________

Date of Birth: ________ month ________ day ________ year

Information about the person administering the screener

Examiner's Name: ______________________

Relationship to Child: ☐ Teacher

☐ Other: ______________________

Screening Date: ______ month ______ day ______ year

☐ First Screening ☐ Second Screening ☐ Third Screening

How Should I Use the Score?

The goal of the *Get Ready to Read!–Revised* Screening Tool is to help guide your efforts to build the skills of the child being screened. The score does not predict a child's eventual reading or writing abilities. It tells where a child is on the path toward reading, so you can help the child achieve his or her greatest potential.

Adapt the experiences and activities you do with a child to his or her level of development. Start where a child is now, then increase the difficulty as the child's skills grow stronger. It is important to build skills in all areas. The Step score descriptions on the back of this page will help you identify appropriate activities.

Look at pages 11–18 in the *Get Ready to Read!–Revised* Early Literacy Manual for ideas on how to engage a child in a variety of activities that build knowledge of letters and sounds, books and print. Use and adapt these activities to your early childhood setting, community program, or home.

Remember, keep it fun and be encouraging!

Score Interpretation

(see reverse side for instructions)

Step Score	Performance Level
Step 1 ☐	Below Average ☐
Step 2 ☐	Average ☐
Step 3 ☐	Above Average ☐
Step 4 ☐	

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Score Interpretation

The *Get Ready to Read!–Revised* Screening Tool provides two ways to interpret the Number Correct score. One method, called the Step score, describes the child's performance in relation to the skills measured by the screener items. Each step describes the child's level of development of important pre-reading skills. The Step score can also be used to identify appropriate activities to build the child's skills. The second method, called the Performance Level, describes the child's performance in relation to the scores of other children within the same age group. This score can help to determine if the child's pre-reading skills are below the average, average, or above the average for her or his age. A child who scores in the below average range may need extra help and attention. Please refer to the Early Literacy Manual for more explanation of the score levels and how to use them.

Step Scores		
Number Correct	Step	Step Description
0–4	1	Children who score in this range have limited understanding of print and letter-sound associations. Carefully designed activities that offer a variety of experiences with books and print are encouraged.
5–13	2	Children who score in this range have a basic understanding of books and print and can recognize some letters. Carefully designed activities that offer a variety of experiences to help the child learn more about letters and sounds, books and print are encouraged.
14–20	3	Children who score in this range have gone beyond the basic understanding of books and print and are learning to identify letter-sound associations. Carefully designed activities that offer a variety of experiences with identifying letters from print, vocalizing letter sounds, and combining sounds to make words are encouraged.
21–25	4	Children who score in this range have a solid understanding of print and letter-sound associations. Activities that reinforce the child's skills at forming words from sounds and identifying words in print are encouraged.

Identifying the Step Score

The Step score is derived from the child's Number Correct score. Identify the Number Correct score range in the left column of the Step Scores table that includes the child's score. The Step number corresponding to that score range is the child's Step score. For example, a Number Correct score of 15 corresponds to Step 3.

Identifying the Performance Level

Performance Levels are determined from the child's age and Number Correct score. The Performance Level table has four columns. The first column shows 6-month age ranges starting from age 3 years 0 months through 5 years 11 months. The next three columns show Number Correct score ranges. The column titles represent the Performance Levels.

In the column labeled Age Range, identify the range that includes the child's age in years and months. Look across that row to find the score range that includes the child's Number Correct score. The column title represents the child's Performance Level. For example, the Performance Level for a child aged 4 years and 1 month with a Number Correct score of 15 is Average.

Performance Level			
	Number Correct		
Age Range (Years:Months)	Below Average	Average	Above Average
3:0–3:5	0–6	7–13	14–25
3:6–3:11	0–8	9–15	16–25
4:0–4:5	0–11	12–18	19–25
4:6–4:11	0–13	14–20	21–25
5:0–5:5	0–16	17–22	23–25
5:5–5:11	0–17	18–23	24–25

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A 0 9 8 7 6 5 4 3 2 1 281230-1 321

Appendix E: LISREL 8.80 for testing the PCLI Mediation Structural Model

E.1 PRELIS 2.80: PRELS results for the 19-item PCLI measurement model;

E.2 LISREL 8.80: CFA results for testing the 6-factor PCLI measurement model;

E.3 LISREL 8.80: SEM results for testing the 6-factor PCLI structural model

DATE: 03/19/2014
TIME: 10:29

P R E L I S 2.80

BY

Karl G. Jöreskog and Dag Sörbom

The following lines were read from file **E:\9SEM2-PCLI_1403\PCLI_Model-19Item.PR2:**

```
!PCLI_Model: PRELIS Run
!Compute Polychoric Correlations and Asymptotic Covariance Matrix
 SY='E:\9SEM2-PCLI_1403\PCLI_Model-19Item.PSF'
 OU MA=PM PM=PCLI_Model.PM AC=PCLI_Model.ACP
```

Total Sample Size = 411

Univariate Marginal Parameters

Variable	Mean	St. Dev.	Thresholds				
pcr17X2	0.000	1.000	-2.816	-2.065	-1.612	-1.167	0.187
pcr19X4	0.000	1.000	-2.442	-1.824	-0.776		
pcr20X5	0.000	1.000	-2.816	-1.931	-0.680		
pcr21X6	0.000	1.000	-2.816	-2.442	-2.337	-1.824	-0.534
ipcY6a	0.000	1.000	-1.437	-0.852	-0.378	0.181	
ipcY7a	0.000	1.000	-1.528	-0.358	0.378	1.341	
fpcY11a	0.000	1.000	-1.311	-0.313	0.520	1.658	
fpcY12a	0.000	1.000	-1.033	-0.281	0.478	1.568	
fpcY13a	0.000	1.000	-0.943	0.070	0.635	1.735	
ak6Y19	0.000	1.000	-1.120				
ak7Y20	0.000	1.000	-1.454				
ak9Y22	0.000	1.000	-0.809				
ak10Y23	0.000	1.000	-0.759				
ew11Y34	0.000	1.000	-0.792				
ew12Y35	0.000	1.000	-0.358				
ew24Y38	0.000	1.000	0.064				
pa14Y25	0.000	1.000	-0.499				
pa15Y26	0.000	1.000	-0.776				
pa16Y27	0.000	1.000	0.499				

Univariate Distributions for Ordinal Variables

pcr17X2	Freq.	Perc.	Bar Chart
2	1	0.2	▯
3	7	1.7	▯▯
4	14	3.4	▯▯▯▯
5	28	6.8	▯▯▯▯▯▯▯
6	186	45.3	▯▯▯
7	175	42.6	▯▯

pcr19X4	Freq.	Perc.	Bar Chart
4	3	0.7	▯
5	11	2.7	▯▯
6	76	18.5	▯▯▯▯▯▯▯▯▯▯▯
7	321	78.1	▯▯▯

pcr20X5	Freq.	Perc.	Bar Chart
3	1	0.2	▯
5	10	2.4	▯▯
6	91	22.1	▯▯▯▯▯▯▯▯▯▯▯▯▯▯
7	309	75.2	▯▯▯

pcr21X6	Freq.	Perc.	Bar Chart
2	1	0.2	▯
3	2	0.5	▯
4	1	0.2	▯
5	10	2.4	▯▯
6	108	26.3	▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯
7	289	70.3	▯▯▯

ipcY6a	Freq.	Perc.	Bar Chart
1	31	7.5	▯▯▯▯▯▯▯▯
2	50	12.2	▯▯▯▯▯▯▯▯▯▯▯▯▯
3	64	15.6	▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯
4	90	21.9	▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯
5	176	42.8	▯▯▯

ipcY7a	Freq.	Perc.	Bar Chart
1	26	6.3	▯▯▯▯▯▯▯▯▯▯
2	122	29.7	▯▯▯
3	118	28.7	▯▯▯
4	108	26.3	▯▯
5	37	9.0	▯▯▯▯▯▯▯▯▯▯▯▯▯▯

fpcY11a	Freq.	Perc.	Bar Chart
1	39	9.5	▯▯▯▯▯▯▯▯▯▯▯▯▯▯
2	116	28.2	▯▯▯
3	132	32.1	▯▯▯
4	104	25.3	▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯
5	20	4.9	▯▯▯▯▯▯▯

fpcY12a	Freq.	Perc.	Bar Chart
1	62	15.1	
2	98	23.8	
3	121	29.4	
4	106	25.8	
5	24	5.8	

fpcY13a	Freq.	Perc.	Bar Chart
1	71	17.3	
2	146	35.5	
3	86	20.9	
4	91	22.1	
5	17	4.1	

ak6Y19	Freq.	Perc.	Bar Chart
0	54	13.1	
1	357	86.9	

ak7Y20	Freq.	Perc.	Bar Chart
0	30	7.3	
1	381	92.7	

ak9Y22	Freq.	Perc.	Bar Chart
0	86	20.9	
1	325	79.1	

ak10Y23	Freq.	Perc.	Bar Chart
0	92	22.4	
1	319	77.6	

ew11Y34	Freq.	Perc.	Bar Chart
0	88	21.4	
1	323	78.6	

ew12Y35	Freq.	Perc.	Bar Chart
0	148	36.0	
1	263	64.0	

ew24Y38	Freq.	Perc.	Bar Chart
0	216	52.6	
1	195	47.4	

pa14Y25	Freq.	Perc.	Bar Chart
0	127	30.9	
1	284	69.1	

pa15Y26	Freq.	Perc.	Bar Chart
0	90	21.9	▯▯▯▯▯▯▯▯▯▯▯▯▯
1	321	78.1	▯▯▯

pa16Y27	Freq.	Perc.	Bar Chart
0	284	69.1	▯▯▯
1	127	30.9	▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯

There ar	Freq.	Perc.	Bar Chart
The	20	most	▯▯▯▯▯▯
2	6	7	▯
0	1	1	▯
1	7	7	▯
0	1	1	▯
1	6	6	▯
0	0	1	▯
1	7	7	▯
1	1	1	▯
1	7	7	▯
0	1	1	▯
1	6	7	▯
0	1	1	▯
1	6	7	▯
1	1	1	▯
1	5	5	▯
0	0	0	▯
1	7	7	▯
0	1	1	▯
1	5	6	▯
0	1	1	▯
1	6	7	▯
0	0	0	▯
1	6	7	▯
1	0	0	▯
1	6	7	▯
0	1	1	▯
1	6	7	▯
0	0	0	▯
1	7	7	▯
0	1	1	▯
1	7	7	▯
0	1	0	▯
1	6	7	▯
1	1	1	▯
1	6	7	▯
1	1	1	▯
1	7	7	▯
1	1	0	▯
1	7	7	▯
1	1	1	▯

Correlations and Test Statistics

(PE=Pearson Product Moment, PC=Polychoric, PS=Polyserial)

Variable	vs.	Variable	Correlation		Chi-Squ.	Test of Model D.F.	Test of Model P-Value	Test of Close Fit RMSEA	Test of Close Fit P-Value
pcr19X4	vs.	pcr17X2	0.637	(PC)	15.875	14	0.321	0.018	1.000
pcr20X5	vs.	pcr17X2	0.646	(PC)	27.945	14	0.014	0.049	1.000
pcr20X5	vs.	pcr19X4	0.728	(PC)	5.814	8	0.668	0.000	1.000
pcr21X6	vs.	pcr17X2	0.669	(PC)	33.460	24	0.095	0.031	1.000
pcr21X6	vs.	pcr19X4	0.759	(PC)	19.908	14	0.133	0.032	1.000
pcr21X6	vs.	pcr20X5	0.920	(PC)	13.079	14	0.520	0.000	1.000
ipcY6a	vs.	pcr17X2	0.082	(PC)	8.798	19	0.977	0.000	1.000
ipcY6a	vs.	pcr19X4	0.106	(PC)	7.237	11	0.780	0.000	1.000
ipcY6a	vs.	pcr20X5	0.127	(PC)	7.529	11	0.755	0.000	1.000
ipcY6a	vs.	pcr21X6	0.099	(PC)	15.405	19	0.697	0.000	1.000
ipcY7a	vs.	pcr17X2	-0.016	(PC)	14.846	19	0.732	0.000	1.000
ipcY7a	vs.	pcr19X4	0.048	(PC)	13.845	11	0.242	0.025	1.000
ipcY7a	vs.	pcr20X5	0.089	(PC)	10.925	11	0.450	0.000	1.000
ipcY7a	vs.	pcr21X6	0.104	(PC)	19.328	19	0.436	0.006	1.000
ipcY7a	vs.	ipcY6a	0.323	(PC)	26.549	15	0.033	0.043	1.000
fpcY11a	vs.	pcr17X2	-0.036	(PC)	16.093	19	0.651	0.000	1.000
fpcY11a	vs.	pcr19X4	-0.006	(PC)	7.915	11	0.721	0.000	1.000
fpcY11a	vs.	pcr20X5	-0.094	(PC)	7.246	11	0.779	0.000	1.000
fpcY11a	vs.	pcr21X6	-0.041	(PC)	20.635	19	0.357	0.014	1.000
fpcY11a	vs.	ipcY6a	0.174	(PC)	11.575	15	0.711	0.000	1.000
fpcY11a	vs.	ipcY7a	0.357	(PC)	27.405	15	0.026	0.045	1.000
fpcY12a	vs.	pcr17X2	-0.050	(PC)	16.760	19	0.606	0.000	1.000
fpcY12a	vs.	pcr19X4	-0.043	(PC)	5.265	11	0.918	0.000	1.000
fpcY12a	vs.	pcr20X5	-0.051	(PC)	12.399	11	0.334	0.018	1.000
fpcY12a	vs.	pcr21X6	0.003	(PC)	17.017	19	0.589	0.000	1.000
fpcY12a	vs.	ipcY6a	0.149	(PC)	19.844	15	0.178	0.028	1.000
fpcY12a	vs.	ipcY7a	0.346	(PC)	14.687	15	0.474	0.000	1.000
fpcY12a	vs.	fpcY11a	0.672	(PC)	29.796	15	0.013	0.049	1.000
fpcY13a	vs.	pcr17X2	0.027	(PC)	11.289	19	0.914	0.000	1.000
fpcY13a	vs.	pcr19X4	0.042	(PC)	14.852	11	0.189	0.029	1.000
fpcY13a	vs.	pcr20X5	-0.026	(PC)	11.296	11	0.419	0.008	1.000
fpcY13a	vs.	pcr21X6	0.074	(PC)	21.096	19	0.332	0.016	1.000
fpcY13a	vs.	ipcY6a	0.130	(PC)	23.411	15	0.076	0.037	1.000
fpcY13a	vs.	ipcY7a	0.391	(PC)	27.994	15	0.022	0.046	1.000
fpcY13a	vs.	fpcY11a	0.675	(PC)	54.886	15	0.000	0.080	0.914
fpcY13a	vs.	fpcY12a	0.589	(PC)	42.961	15	0.000	0.067	0.989
ak6Y19	vs.	pcr17X2	-0.151	(PC)	5.588	4	0.232	0.031	0.985
ak6Y19	vs.	pcr19X4	-0.274	(PC)	1.220	2	0.543	0.000	0.980
ak6Y19	vs.	pcr20X5	-0.126	(PC)	0.194	2	0.907	0.000	0.998
ak6Y19	vs.	pcr21X6	-0.135	(PC)	2.613	4	0.625	0.000	0.999
ak6Y19	vs.	ipcY6a	0.054	(PC)	0.311	3	0.958	0.000	1.000
ak6Y19	vs.	ipcY7a	0.291	(PC)	1.398	3	0.706	0.000	0.998
ak6Y19	vs.	fpcY11a	0.168	(PC)	6.681	3	0.083	0.055	0.897
ak6Y19	vs.	fpcY12a	0.324	(PC)	4.129	3	0.248	0.030	0.969
ak6Y19	vs.	fpcY13a	0.304	(PC)	5.886	3	0.117	0.048	0.924
ak7Y20	vs.	pcr17X2	-0.039	(PC)	5.651	4	0.227	0.032	0.985
ak7Y20	vs.	pcr19X4	-0.006	(PC)	2.382	2	0.304	0.022	0.942
ak7Y20	vs.	pcr20X5	-0.017	(PC)	0.308	2	0.857	0.000	0.997
ak7Y20	vs.	pcr21X6	0.055	(PC)	4.430	4	0.351	0.016	0.993
ak7Y20	vs.	ipcY6a	-0.056	(PC)	0.686	3	0.876	0.000	0.999
ak7Y20	vs.	ipcY7a	0.111	(PC)	1.944	3	0.584	0.000	0.995
ak7Y20	vs.	fpcY11a	0.076	(PC)	11.127	3	0.011	0.081	0.682
ak7Y20	vs.	fpcY12a	0.133	(PC)	6.630	3	0.085	0.054	0.899
ak7Y20	vs.	fpcY13a	0.037	(PC)	1.946	3	0.584	0.000	0.995
ak7Y20	vs.	ak6Y19	0.756	(PC)	0.000	0	1.000	0.000	1.000
ak9Y22	vs.	pcr17X2	-0.180	(PC)	7.789	4	0.100	0.048	0.957

ak9Y22	vs.	pcr19X4	-0.135	(PC)	1.181	2	0.554	0.000	0.981
ak9Y22	vs.	pcr20X5	-0.157	(PC)	0.269	2	0.874	0.000	0.997
ak9Y22	vs.	pcr21X6	-0.083	(PC)	5.891	4	0.207	0.034	0.983
ak9Y22	vs.	ipcY6a	0.169	(PC)	4.034	3	0.258	0.029	0.970
ak9Y22	vs.	ipcY7a	0.271	(PC)	2.666	3	0.446	0.000	0.989
ak9Y22	vs.	fpcY11a	0.090	(PC)	2.354	3	0.502	0.000	0.992
ak9Y22	vs.	fpcY12a	0.228	(PC)	3.246	3	0.355	0.014	0.983
ak9Y22	vs.	fpcY13a	0.172	(PC)	4.740	3	0.192	0.038	0.956
ak9Y22	vs.	ak6Y19	0.666	(PC)	0.000	0	1.000	0.038	1.000
ak9Y22	vs.	ak7Y20	0.427	(PC)	0.000	0	1.000	0.038	1.000
ak10Y23	vs.	pcr17X2	-0.103	(PC)	4.967	4	0.291	0.024	0.990
ak10Y23	vs.	pcr19X4	-0.047	(PC)	3.176	2	0.204	0.038	0.905
ak10Y23	vs.	pcr20X5	-0.105	(PC)	1.888	2	0.389	0.000	0.960
ak10Y23	vs.	pcr21X6	-0.128	(PC)	1.651	4	0.800	0.000	1.000
ak10Y23	vs.	ipcY6a	0.130	(PC)	4.231	3	0.238	0.032	0.967
ak10Y23	vs.	ipcY7a	0.252	(PC)	3.739	3	0.291	0.024	0.975
ak10Y23	vs.	fpcY11a	0.056	(PC)	3.201	3	0.362	0.013	0.983
ak10Y23	vs.	fpcY12a	0.166	(PC)	1.272	3	0.736	0.000	0.998
ak10Y23	vs.	fpcY13a	0.124	(PC)	3.952	3	0.267	0.028	0.972
ak10Y23	vs.	ak6Y19	0.521	(PC)	0.000	0	1.000	0.028	1.000
ak10Y23	vs.	ak7Y20	0.441	(PC)	0.000	0	1.000	0.028	1.000
ak10Y23	vs.	ak9Y22	0.477	(PC)	0.000	0	1.000	0.028	1.000
ew11Y34	vs.	pcr17X2	0.066	(PC)	7.967	4	0.093	0.049	0.954
ew11Y34	vs.	pcr19X4	0.071	(PC)	2.520	2	0.284	0.025	0.936
ew11Y34	vs.	pcr20X5	0.090	(PC)	2.702	2	0.259	0.029	0.928
ew11Y34	vs.	pcr21X6	0.071	(PC)	1.855	4	0.762	0.000	1.000
ew11Y34	vs.	ipcY6a	0.065	(PC)	0.427	3	0.935	0.000	1.000
ew11Y34	vs.	ipcY7a	0.002	(PC)	2.509	3	0.474	0.000	0.991
ew11Y34	vs.	fpcY11a	0.001	(PC)	0.556	3	0.906	0.000	1.000
ew11Y34	vs.	fpcY12a	-0.031	(PC)	2.660	3	0.447	0.000	0.989
ew11Y34	vs.	fpcY13a	0.003	(PC)	4.042	3	0.257	0.029	0.970
ew11Y34	vs.	ak6Y19	0.162	(PC)	0.000	0	1.000	0.029	1.000
ew11Y34	vs.	ak7Y20	0.242	(PC)	0.000	0	1.000	0.029	1.000
ew11Y34	vs.	ak9Y22	0.180	(PC)	0.000	0	1.000	0.029	1.000
ew11Y34	vs.	ak10Y23	0.192	(PC)	0.000	0	1.000	0.029	1.000
ew12Y35	vs.	pcr17X2	0.057	(PC)	8.617	4	0.071	0.053	0.940
ew12Y35	vs.	pcr19X4	0.158	(PC)	4.986	2	0.083	0.060	0.799
ew12Y35	vs.	pcr20X5	0.037	(PC)	1.069	2	0.586	0.000	0.984
ew12Y35	vs.	pcr21X6	0.075	(PC)	8.081	4	0.089	0.050	0.951
ew12Y35	vs.	ipcY6a	0.203	(PC)	2.906	3	0.406	0.000	0.987
ew12Y35	vs.	ipcY7a	0.062	(PC)	5.106	3	0.164	0.041	0.947
ew12Y35	vs.	fpcY11a	-0.032	(PC)	4.305	3	0.230	0.033	0.965
ew12Y35	vs.	fpcY12a	-0.011	(PC)	5.593	3	0.133	0.046	0.933
ew12Y35	vs.	fpcY13a	0.032	(PC)	10.375	3	0.016	0.077	0.723
ew12Y35	vs.	ak6Y19	0.164	(PC)	0.000	0	1.000	0.077	1.000
ew12Y35	vs.	ak7Y20	0.055	(PC)	0.000	0	1.000	0.077	1.000
ew12Y35	vs.	ak9Y22	0.068	(PC)	0.000	0	1.000	0.077	1.000
ew12Y35	vs.	ak10Y23	0.208	(PC)	0.000	0	1.000	0.077	1.000
ew12Y35	vs.	ew11Y34	0.304	(PC)	0.000	0	1.000	0.077	1.000
ew24Y38	vs.	pcr17X2	0.033	(PC)	2.207	4	0.698	0.000	0.999
ew24Y38	vs.	pcr19X4	-0.023	(PC)	0.460	2	0.795	0.000	0.995
ew24Y38	vs.	pcr20X5	-0.120	(PC)	1.032	2	0.597	0.000	0.984
ew24Y38	vs.	pcr21X6	-0.025	(PC)	2.751	4	0.600	0.000	0.999
ew24Y38	vs.	ipcY6a	0.155	(PC)	0.048	3	0.997	0.000	1.000
ew24Y38	vs.	ipcY7a	0.021	(PC)	1.277	3	0.735	0.000	0.998
ew24Y38	vs.	fpcY11a	0.039	(PC)	1.379	3	0.710	0.000	0.998
ew24Y38	vs.	fpcY12a	0.130	(PC)	0.132	3	0.988	0.000	1.000
ew24Y38	vs.	fpcY13a	0.087	(PC)	1.523	3	0.677	0.000	0.997
ew24Y38	vs.	ak6Y19	0.104	(PC)	0.000	0	1.000	0.000	1.000
ew24Y38	vs.	ak7Y20	0.010	(PC)	0.000	0	1.000	0.000	1.000
ew24Y38	vs.	ak9Y22	0.316	(PC)	0.000	0	1.000	0.000	1.000

ew24Y38	vs.	ak10Y23	0.095	(PC)	0.000	0	1.000	0.000	1.000
ew24Y38	vs.	ew11Y34	0.268	(PC)	0.000	0	1.000	0.000	1.000
ew24Y38	vs.	ew12Y35	0.231	(PC)	0.000	0	1.000	0.000	1.000
pa14Y25	vs.	pcr17X2	-0.091	(PC)	3.086	4	0.544	0.000	0.998
pa14Y25	vs.	pcr19X4	-0.111	(PC)	2.437	2	0.296	0.023	0.939
pa14Y25	vs.	pcr20X5	-0.032	(PC)	1.250	2	0.535	0.000	0.979
pa14Y25	vs.	pcr21X6	-0.029	(PC)	12.394	4	0.015	0.071	0.825
pa14Y25	vs.	ipcY6a	0.176	(PC)	3.622	3	0.305	0.022	0.977
pa14Y25	vs.	ipcY7a	0.101	(PC)	1.044	3	0.791	0.000	0.999
pa14Y25	vs.	fpcY11a	0.061	(PC)	2.658	3	0.447	0.000	0.989
pa14Y25	vs.	fpcY12a	0.117	(PC)	0.910	3	0.823	0.000	0.999
pa14Y25	vs.	fpcY13a	0.063	(PC)	3.677	3	0.299	0.023	0.976
pa14Y25	vs.	ak6Y19	0.362	(PC)	0.000	0	1.000	0.023	1.000
pa14Y25	vs.	ak7Y20	0.219	(PC)	0.000	0	1.000	0.023	1.000
pa14Y25	vs.	ak9Y22	0.554	(PC)	0.000	0	1.000	0.023	1.000
pa14Y25	vs.	ak10Y23	0.487	(PC)	0.000	0	1.000	0.023	1.000
pa14Y25	vs.	ew11Y34	0.156	(PC)	0.000	0	1.000	0.023	1.000
pa14Y25	vs.	ew12Y35	0.273	(PC)	0.000	0	1.000	0.023	1.000
pa14Y25	vs.	ew24Y38	0.246	(PC)	0.000	0	1.000	0.023	1.000
pa15Y26	vs.	pcr17X2	-0.114	(PC)	0.635	4	0.959	0.000	1.000
pa15Y26	vs.	pcr19X4	0.038	(PC)	7.412	2	0.025	0.081	0.628
pa15Y26	vs.	pcr20X5	-0.057	(PC)	1.140	2	0.566	0.000	0.982
pa15Y26	vs.	pcr21X6	0.019	(PC)	7.736	4	0.102	0.048	0.958
pa15Y26	vs.	ipcY6a	0.227	(PC)	1.553	3	0.670	0.000	0.997
pa15Y26	vs.	ipcY7a	0.178	(PC)	1.721	3	0.632	0.000	0.996
pa15Y26	vs.	fpcY11a	0.078	(PC)	4.179	3	0.243	0.031	0.968
pa15Y26	vs.	fpcY12a	0.118	(PC)	6.914	3	0.075	0.056	0.888
pa15Y26	vs.	fpcY13a	0.161	(PC)	11.401	3	0.010	0.083	0.666
pa15Y26	vs.	ak6Y19	0.426	(PC)	0.000	0	1.000	0.083	1.000
pa15Y26	vs.	ak7Y20	0.367	(PC)	0.000	0	1.000	0.083	1.000
pa15Y26	vs.	ak9Y22	0.605	(PC)	0.000	0	1.000	0.083	1.000
pa15Y26	vs.	ak10Y23	0.549	(PC)	0.000	0	1.000	0.083	1.000
pa15Y26	vs.	ew11Y34	0.180	(PC)	0.000	0	1.000	0.083	1.000
pa15Y26	vs.	ew12Y35	0.246	(PC)	0.000	0	1.000	0.083	1.000
pa15Y26	vs.	ew24Y38	0.243	(PC)	0.000	0	1.000	0.083	1.000
pa15Y26	vs.	pa14Y25	0.700	(PC)	0.000	0	1.000	0.083	1.000
pa16Y27	vs.	pcr17X2	-0.024	(PC)	5.126	4	0.275	0.026	0.989
pa16Y27	vs.	pcr19X4	-0.038	(PC)	5.281	2	0.071	0.063	0.779
pa16Y27	vs.	pcr20X5	0.111	(PC)	0.535	2	0.765	0.000	0.994
pa16Y27	vs.	pcr21X6	0.053	(PC)	2.598	4	0.627	0.000	0.999
pa16Y27	vs.	ipcY6a	0.272	(PC)	1.628	3	0.653	0.000	0.997
pa16Y27	vs.	ipcY7a	0.203	(PC)	1.726	3	0.631	0.000	0.996
pa16Y27	vs.	fpcY11a	0.071	(PC)	2.562	3	0.464	0.000	0.990
pa16Y27	vs.	fpcY12a	0.058	(PC)	1.038	3	0.792	0.000	0.999
pa16Y27	vs.	fpcY13a	0.147	(PC)	1.274	3	0.735	0.000	0.998
pa16Y27	vs.	ak6Y19	0.159	(PC)	0.000	0	1.000	0.000	1.000
pa16Y27	vs.	ak7Y20	-0.084	(PC)	0.000	0	1.000	0.000	1.000
pa16Y27	vs.	ak9Y22	0.268	(PC)	0.000	0	1.000	0.000	1.000
pa16Y27	vs.	ak10Y23	0.202	(PC)	0.000	0	1.000	0.000	1.000
pa16Y27	vs.	ew11Y34	0.176	(PC)	0.000	0	1.000	0.000	1.000
pa16Y27	vs.	ew12Y35	0.163	(PC)	0.000	0	1.000	0.000	1.000
pa16Y27	vs.	ew24Y38	0.236	(PC)	0.000	0	1.000	0.000	1.000
pa16Y27	vs.	pa14Y25	0.393	(PC)	0.000	0	1.000	0.000	1.000
pa16Y27	vs.	pa15Y26	0.346	(PC)	0.000	0	1.000	0.000	1.000

Percentage of Tests Exceeding 0.5% Significance Level: 0.0%

Percentage of Tests Exceeding 1.0% Significance Level: 0.0%

Percentage of Tests Exceeding 5.0% Significance Level: 0.0%

Correlation Matrix

	pcr17X2	pcr19X4	pcr20X5	pcr21X6	ipcY6a	ipcY7a
pcr17X2	1.000					
pcr19X4	0.637	1.000				
pcr20X5	0.646	0.728	1.000			
pcr21X6	0.669	0.759	0.920	1.000		
ipcY6a	0.082	0.106	0.127	0.099	1.000	
ipcY7a	-0.016	0.048	0.089	0.104	0.323	1.000
fpcY11a	-0.036	-0.006	-0.094	-0.041	0.174	0.357
fpcY12a	-0.050	-0.043	-0.051	0.003	0.149	0.346
fpcY13a	0.027	0.042	-0.026	0.074	0.130	0.391
ak6Y19	-0.151	-0.274	-0.126	-0.135	0.054	0.291
ak7Y20	-0.039	-0.006	-0.017	0.055	-0.056	0.111
ak9Y22	-0.180	-0.135	-0.157	-0.083	0.169	0.271
ak10Y23	-0.103	-0.047	-0.105	-0.128	0.130	0.252
ew11Y34	0.066	0.071	0.090	0.071	0.065	0.002
ew12Y35	0.057	0.158	0.037	0.075	0.203	0.062
ew24Y38	0.033	-0.023	-0.120	-0.025	0.155	0.021
pa14Y25	-0.091	-0.111	-0.032	-0.029	0.176	0.101
pa15Y26	-0.114	0.038	-0.057	0.019	0.227	0.178
pa16Y27	-0.024	-0.038	0.111	0.053	0.272	0.203

Correlation Matrix (continued)

	fpcY11a	fpcY12a	fpcY13a	ak6Y19	ak7Y20	ak9Y22
fpcY11a	1.000					
fpcY12a	0.672	1.000				
fpcY13a	0.675	0.589	1.000			
ak6Y19	0.168	0.324	0.304	1.000		
ak7Y20	0.076	0.133	0.037	0.756	1.000	
ak9Y22	0.090	0.228	0.172	0.666	0.427	1.000
ak10Y23	0.056	0.166	0.124	0.521	0.441	0.477
ew11Y34	0.001	-0.031	0.003	0.162	0.242	0.180
ew12Y35	-0.032	-0.011	0.032	0.164	0.055	0.068
ew24Y38	0.039	0.130	0.087	0.104	0.010	0.316
pa14Y25	0.061	0.117	0.063	0.362	0.219	0.554
pa15Y26	0.078	0.118	0.161	0.426	0.367	0.605
pa16Y27	0.071	0.058	0.147	0.159	-0.084	0.268

Correlation Matrix (continued)

	ak10Y23	ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26
ak10Y23	1.000					
ew11Y34	0.192	1.000				
ew12Y35	0.208	0.304	1.000			
ew24Y38	0.095	0.268	0.231	1.000		
pa14Y25	0.487	0.156	0.273	0.246	1.000	
pa15Y26	0.549	0.180	0.246	0.243	0.700	1.000
pa16Y27	0.202	0.176	0.163	0.236	0.393	0.346

Correlation Matrix (continued)

	pa16Y27
pa16Y27	1.000

Means

pcr17X2	pcr19X4	pcr20X5	pcr21X6	ipcY6a	ipcY7a
0.000	0.000	0.000	0.000	0.000	0.000

Means (continued)

fpcY11a	fpcY12a	fpcY13a	ak6Y19	ak7Y20	ak9Y22
0.000	0.000	0.000	0.000	0.000	0.000

Means (continued)

ak10Y23	ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26
0.000	0.000	0.000	0.000	0.000	0.000

Means (continued)

pa16Y27
0.000

Standard Deviations

pcr17X2	pcr19X4	pcr20X5	pcr21X6	ipcY6a	ipcY7a
1.000	1.000	1.000	1.000	1.000	1.000

Standard Deviations (continued)

fpcY11a	fpcY12a	fpcY13a	ak6Y19	ak7Y20	ak9Y22
1.000	1.000	1.000	1.000	1.000	1.000

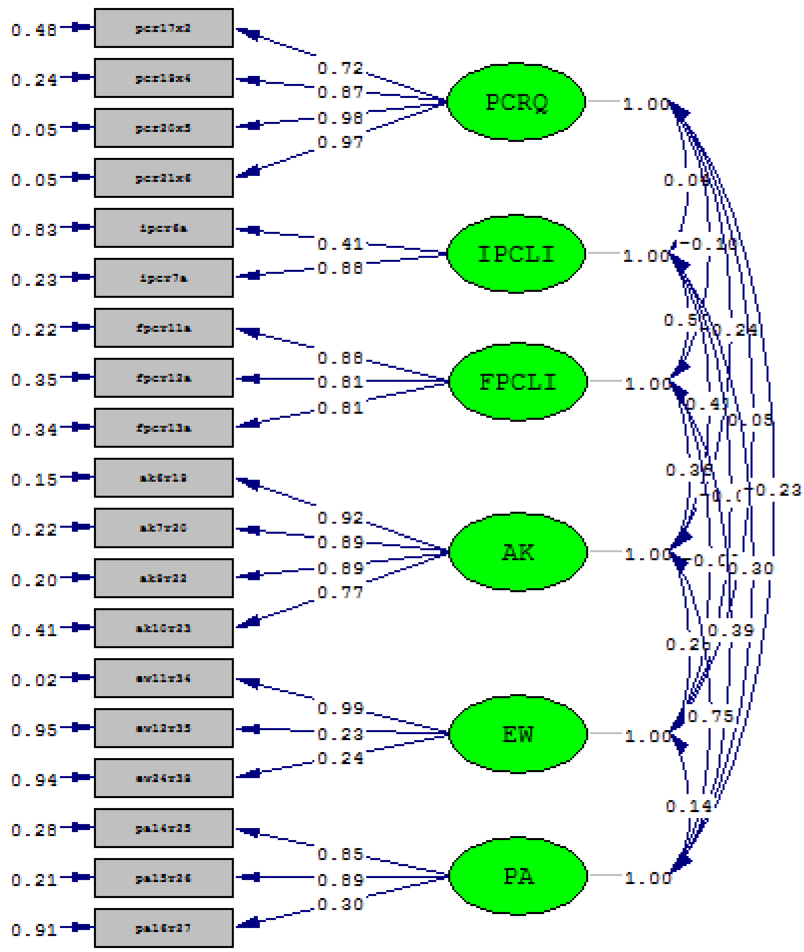
Standard Deviations (continued)

ak10Y23	ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26
1.000	1.000	1.000	1.000	1.000	1.000

Standard Deviations (continued)

pa16Y27
1.000

The Problem used 187344 Bytes (= 0.1% of available workspace)



Chi-Square=295.83, df=137, P-value=0.00000, RMSEA=0.053

DATE: 3/19/2014
TIME: 10:48

L I S R E L 8.80

BY

Karl G. Jöreskog and Dag Sörbom

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The following lines were read from file **E:\9SEM2-PCLI_1403\PCLI_Model-CFA.Spl:**

```
!PCLI_Model: LISREL Run 1
!Test Six-Factor PCLI Full Measurement Model: CFA Model M1(19-item)
 Observed Variables: pcr17X2 pcr19X4 pcr20X5 pcr21X6 ipcY6a ipcY7a fpcY11a fpcY12a fpcY13a
ak6Y19 ak7Y20 ak9Y22 ak10Y23 ew11Y34 ew12Y35 ew24Y38 pa14Y25 pa15Y26 pa16Y27
 Correlation Matrix from File PCLI_Model.PM
 Asymptotic Covariance Matrix from File PCLI_Model.ACP
 Sample Size: 411
 Latent Variables: PCRQ IPCLI FPCLI AK EW PA
 Relationships:
 pcr17X2 pcr19X4 pcr20X5 pcr21X6 = PCRQ
 ipcY6a ipcY7a = IPCLI
 fpcY11a fpcY12a fpcY13a = FPCLI
 ak6Y19 ak7Y20 ak9Y22 ak10Y23 = AK
 ew11Y34 ew12Y35 ew24Y38 = EW
 pa14Y25 pa15Y26 pa16Y27 = PA
 LISREL Output: ME=WL ND=3 SC RS MI
 Path Diagram
 End of Problem
6.6in.02in
```

!PCLI_Model: LISREL Run 1

Correlation Matrix

	pcr17X2	pcr19X4	pcr20X5	pcr21X6	ipcY6a	ipcY7a
pcr17X2	1.000					
pcr19X4	0.637	1.000				
pcr20X5	0.646	0.728	1.000			
pcr21X6	0.669	0.759	0.920	1.000		
ipcY6a	0.082	0.106	0.127	0.099	1.000	
ipcY7a	-0.016	0.048	0.089	0.104	0.323	1.000
fpcY11a	-0.036	-0.006	-0.094	-0.041	0.174	0.357
fpcY12a	-0.050	-0.043	-0.051	0.003	0.149	0.346
fpcY13a	0.027	0.042	-0.026	0.074	0.130	0.392
ak6Y19	-0.151	-0.274	-0.126	-0.135	0.054	0.291
ak7Y20	-0.039	-0.006	-0.017	0.055	-0.056	0.111
ak9Y22	-0.180	-0.135	-0.157	-0.083	0.169	0.271
ak10Y23	-0.103	-0.047	-0.105	-0.128	0.130	0.252
ew11Y34	0.066	0.071	0.090	0.071	0.065	0.002
ew12Y35	0.057	0.158	0.037	0.075	0.203	0.062
ew24Y38	0.033	-0.023	-0.120	-0.025	0.155	0.021
pa14Y25	-0.091	-0.111	-0.032	-0.029	0.176	0.101
pa15Y26	-0.114	0.038	-0.057	0.019	0.227	0.178
pa16Y27	-0.024	-0.038	0.111	0.053	0.272	0.203

Correlation Matrix (continued)

	fpcY11a	fpcY12a	fpcY13a	ak6Y19	ak7Y20	ak9Y22
fpcY11a	1.000					
fpcY12a	0.672	1.000				
fpcY13a	0.675	0.589	1.000			
ak6Y19	0.168	0.324	0.304	1.000		
ak7Y20	0.076	0.133	0.037	0.756	1.000	
ak9Y22	0.090	0.228	0.172	0.666	0.427	1.000
ak10Y23	0.056	0.166	0.124	0.521	0.441	0.477
ew11Y34	0.001	-0.031	0.003	0.162	0.242	0.180
ew12Y35	-0.032	-0.011	0.032	0.164	0.055	0.068
ew24Y38	0.039	0.130	0.087	0.104	0.010	0.316
pa14Y25	0.061	0.117	0.063	0.362	0.219	0.554
pa15Y26	0.078	0.118	0.161	0.426	0.367	0.605
pa16Y27	0.071	0.058	0.147	0.159	-0.084	0.268

Correlation Matrix (continued)

	ak10Y23	ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26
ak10Y23	1.000					
ew11Y34	0.192	1.000				
ew12Y35	0.208	0.304	1.000			
ew24Y38	0.095	0.268	0.231	1.000		
pa14Y25	0.487	0.156	0.273	0.246	1.000	
pa15Y26	0.549	0.180	0.246	0.243	0.700	1.000
pa16Y27	0.202	0.176	0.163	0.236	0.393	0.346

Correlation Matrix (continued)

	pa16Y27
pa16Y27	1.000

Parameter Specifications

LAMBDA-X

	PCRQ	IPCLI	FPCLI	AK	EW	PA
pcr17X2	1	0	0	0	0	0
pcr19X4	2	0	0	0	0	0
pcr20X5	3	0	0	0	0	0
pcr21X6	4	0	0	0	0	0
ipcY6a	0	5	0	0	0	0
ipcY7a	0	6	0	0	0	0
fpcY11a	0	0	7	0	0	0
fpcY12a	0	0	8	0	0	0
fpcY13a	0	0	9	0	0	0
ak6Y19	0	0	0	10	0	0
ak7Y20	0	0	0	11	0	0
ak9Y22	0	0	0	12	0	0
ak10Y23	0	0	0	13	0	0
ew11Y34	0	0	0	0	14	0
ew12Y35	0	0	0	0	15	0
ew24Y38	0	0	0	0	16	0
pa14Y25	0	0	0	0	0	17
pa15Y26	0	0	0	0	0	18
pa16Y27	0	0	0	0	0	19

PHI

	PCRQ	IPCLI	FPCLI	AK	EW	PA
PCRQ	0					
IPCLI	20	0				
FPCLI	21	22	0			
AK	23	24	25	0		
EW	26	27	28	29	0	
PA	30	31	32	33	34	0

THETA-DELTA

pcr17X2	pcr19X4	pcr20X5	pcr21X6	ipcY6a	ipcY7a
35	36	37	38	39	40

THETA-DELTA (continued)

fpcY11a	fpcY12a	fpcY13a	ak6Y19	ak7Y20	ak9Y22
41	42	43	44	45	46

THETA-DELTA (continued)

ak10Y23	ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26
47	48	49	50	51	52

THETA-DELTA (continued)

pa16Y27
53

!PCLI Model: LISREL Run 1

Number of Iterations = 26

LISREL Estimates (Weighted Least Squares)

LAMBDA-X

	PCRQ	IPCLI	FPCLI	AK	EW	PA
pcr17X2	0.721 (0.030) 23.760	- -	- -	- -	- -	- -
pcr19X4	0.874 (0.027) 32.502	- -	- -	- -	- -	- -
pcr20X5	0.977 (0.014) 69.483	- -	- -	- -	- -	- -
pcr21X6	0.972 (0.013) 72.022	- -	- -	- -	- -	- -
ipcY6a	- -	0.414 (0.045) 9.226	- -	- -	- -	- -
ipcY7a	- -	0.879 (0.070) 12.543	- -	- -	- -	- -
fpcY11a	- -	- -	0.881 (0.020) 43.349	- -	- -	- -
fpcY12a	- -	- -	0.809 (0.024) 33.451	- -	- -	- -
fpcY13a	- -	- -	0.812 (0.025) 32.207	- -	- -	- -
ak6Y19	- -	- -	- -	0.921 (0.029) 31.377	- -	- -
ak7Y20	- -	- -	- -	0.886 (0.042) 21.116	- -	- -
ak9Y22	- -	- -	- -	0.894 (0.033) 26.947	- -	- -
ak10Y23	- -	- -	- -	0.770 (0.039) 19.695	- -	- -
ew11Y34	- -	- -	- -	- -	0.990 (0.235) 4.220	- -
ew12Y35	- -	- -	- -	- -	0.226 (0.071) 3.171	- -
ew24Y38	- -	- -	- -	- -	0.239 (0.075) 3.184	- -

pa14Y25	- -	- -	- -	- -	- -	0.846 (0.041) 20.429
pa15Y26	- -	- -	- -	- -	- -	0.889 (0.039) 22.883
pa16Y27	- -	- -	- -	- -	- -	0.299 (0.053) 5.619

PHI

	PCRQ	IPCLI	FPCLI	AK	EW	PA
PCRQ	1.000					
IPCLI	0.039 (0.052) 0.763	1.000				
FPCLI	-0.097 (0.044) -2.181	0.558 (0.059) 9.499	1.000			
AK	-0.239 (0.042) -5.629	0.411 (0.049) 8.339	0.358 (0.046) 7.778	1.000		
EW	0.055 (0.068) 0.810	-0.076 (0.073) -1.048	-0.005 (0.060) -0.078	0.280 (0.080) 3.491	1.000	
PA	-0.233 (0.052) -4.474	0.297 (0.056) 5.290	0.388 (0.049) 7.900	0.749 (0.037) 20.467	0.139 (0.072) 1.929	1.000

THETA-DELTA

pcr17X2	pcr19X4	pcr20X5	pcr21X6	ipcY6a	ipcY7a
0.481 (0.066) 7.291	0.236 (0.068) 3.455	0.046 (0.057) 0.808	0.055 (0.056) 0.979	0.829 (0.062) 13.418	0.227 (0.133) 1.705

THETA-DELTA (continued)

fpcY11a	fpcY12a	fpcY13a	ak6Y19	ak7Y20	ak9Y22
0.224 (0.061) 3.673	0.346 (0.063) 5.496	0.341 (0.064) 5.313	0.151 (0.073) 2.063	0.215 (0.089) 2.410	0.201 (0.077) 2.609

THETA-DELTA (continued)

ak10Y23	ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26
0.407 (0.078) 5.217	0.019 (0.468) 0.041	0.949 (0.059) 16.108	0.943 (0.061) 15.470	0.284 (0.086) 3.308	0.209 (0.085) 2.462

THETA-DELTA (continued)

pa16Y27
0.910 (0.059) 15.486

Squared Multiple Correlations for X - Variables

pcr17X2	pcr19X4	pcr20X5	pcr21X6	ipcY6a	ipcY7a
0.519	0.764	0.954	0.945	0.171	0.773

Squared Multiple Correlations for X - Variables (continued)

fpcY11a	fpcY12a	fpcY13a	ak6Y19	ak7Y20	ak9Y22
0.776	0.654	0.659	0.849	0.785	0.799

Squared Multiple Correlations for X - Variables (continued)

ak10Y23	ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26
0.593	0.981	0.051	0.057	0.716	0.791

Squared Multiple Correlations for X - Variables (continued)

pa16Y27
0.090

Goodness of Fit Statistics

```
Degrees of Freedom = 137
Minimum Fit Function Chi-Square = 295.831 (P = 0.00)
Estimated Non-centrality Parameter (NCP) = 158.831
90 Percent Confidence Interval for NCP = (113.058 ; 212.352)

Minimum Fit Function Value = 0.722
Population Discrepancy Function Value (F0) = 0.387
90 Percent Confidence Interval for F0 = (0.276 ; 0.518)
Root Mean Square Error of Approximation (RMSEA) = 0.0532
90 Percent Confidence Interval for RMSEA = (0.0449 ; 0.0615)
P-Value for Test of Close Fit (RMSEA < 0.05) = 0.256

Expected Cross-Validation Index (ECVI) = 0.980
90 Percent Confidence Interval for ECVI = (0.868 ; 1.111)
ECVI for Saturated Model = 0.927
ECVI for Independence Model = 22.251

Chi-Square for Independence Model with 171 Degrees of Freedom = 9085.002
Independence AIC = 9123.002
Model AIC = 401.831
Saturated AIC = 380.000
Independence CAIC = 9218.355
Model CAIC = 667.816
Saturated CAIC = 1333.533

Normed Fit Index (NFI) = 0.967
Non-Normed Fit Index (NNFI) = 0.978
Parsimony Normed Fit Index (PNFI) = 0.775
Comparative Fit Index (CFI) = 0.982
Incremental Fit Index (IFI) = 0.982
Relative Fit Index (RFI) = 0.959

Critical N (CN) = 248.278


Root Mean Square Residual (RMR) = 0.116
Standardized RMR = 0.116
Goodness of Fit Index (GFI) = 0.982
Adjusted Goodness of Fit Index (AGFI) = 0.976
Parsimony Goodness of Fit Index (PGFI) = 0.708
```

Fitted Covariance Matrix

	pcr17X2	pcr19X4	pcr20X5	pcr21X6	ipcY6a	ipcY7a
pcr17X2	1.000					
pcr19X4	0.630	1.000				
pcr20X5	0.704	0.854	1.000			
pcr21X6	0.701	0.850	0.950	1.000		
ipcY6a	0.012	0.014	0.016	0.016	1.000	
ipcY7a	0.025	0.030	0.034	0.034	0.364	1.000
fpcY11a	-0.062	-0.075	-0.084	-0.083	0.203	0.432
fpcY12a	-0.057	-0.069	-0.077	-0.076	0.187	0.397
fpcY13a	-0.057	-0.069	-0.077	-0.077	0.187	0.398
ak6Y19	-0.158	-0.192	-0.215	-0.214	0.157	0.333
ak7Y20	-0.152	-0.185	-0.206	-0.205	0.151	0.320
ak9Y22	-0.154	-0.186	-0.208	-0.207	0.152	0.323
ak10Y23	-0.132	-0.161	-0.180	-0.179	0.131	0.279
ew11Y34	0.039	0.047	0.053	0.053	-0.031	-0.066
ew12Y35	0.009	0.011	0.012	0.012	-0.007	-0.015
ew24Y38	0.009	0.011	0.013	0.013	-0.008	-0.016
pa14Y25	-0.142	-0.172	-0.193	-0.192	0.104	0.221
pa15Y26	-0.149	-0.181	-0.202	-0.201	0.109	0.232
pa16Y27	-0.050	-0.061	-0.068	-0.068	0.037	0.078

Fitted Covariance Matrix (continued)

	fpcY11a	fpcY12a	fpcY13a	ak6Y19	ak7Y20	ak9Y22
fpcY11a	1.000					
fpcY12a	0.712	1.000				
fpcY13a	0.715	0.657	1.000			
ak6Y19	0.291	0.267	0.268	1.000		
ak7Y20	0.279	0.256	0.257	0.816	1.000	
ak9Y22	0.282	0.259	0.260	0.823	0.792	1.000
ak10Y23	0.243	0.223	0.224	0.710	0.682	0.688
ew11Y34	-0.004	-0.004	-0.004	0.255	0.246	0.248
ew12Y35	-0.001	-0.001	-0.001	0.058	0.056	0.056
ew24Y38	-0.001	-0.001	-0.001	0.062	0.059	0.060
pa14Y25	0.289	0.266	0.267	0.584	0.562	0.567
pa15Y26	0.304	0.279	0.280	0.614	0.590	0.596
pa16Y27	0.102	0.094	0.094	0.207	0.199	0.200

Fitted Covariance Matrix (continued)

	ak10Y23	ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26
ak10Y23	1.000					
ew11Y34	0.214	1.000				
ew12Y35	0.049	0.224	1.000			
ew24Y38	0.051	0.236	0.054	1.000		
pa14Y25	0.489	0.116	0.026	0.028	1.000	
pa15Y26	0.513	0.122	0.028	0.029	0.753	1.000
pa16Y27	0.173	0.041	0.009	0.010	0.253	0.266

Fitted Covariance Matrix (continued)

	pa16Y27
pa16Y27	1.000

Fitted Residuals

	pcr17X2	pcr19X4	pcr20X5	pcr21X6	ipcY6a	ipcY7a
pcr17X2	0.000					
pcr19X4	0.007	0.000				
pcr20X5	-0.058	-0.126	0.000			
pcr21X6	-0.032	-0.091	-0.030	0.000		
ipcY6a	0.070	0.092	0.111	0.083	0.000	
ipcY7a	-0.041	0.018	0.055	0.070	-0.041	0.000
fpcY11a	0.025	0.069	-0.010	0.042	-0.030	-0.075
fpcY12a	0.007	0.025	0.026	0.080	-0.038	-0.051
fpcY13a	0.084	0.111	0.051	0.150	-0.057	-0.007
ak6Y19	0.007	-0.082	0.088	0.079	-0.102	-0.042
ak7Y20	0.113	0.179	0.189	0.261	-0.206	-0.210
ak9Y22	-0.026	0.052	0.051	0.124	0.017	-0.052
ak10Y23	0.029	0.114	0.074	0.051	-0.001	-0.026
ew11Y34	0.027	0.023	0.037	0.019	0.097	0.068
ew12Y35	0.048	0.147	0.025	0.063	0.210	0.077
ew24Y38	0.024	-0.034	-0.132	-0.037	0.163	0.037
pa14Y25	0.051	0.062	0.161	0.162	0.072	-0.120
pa15Y26	0.036	0.220	0.146	0.220	0.118	-0.054
pa16Y27	0.026	0.023	0.179	0.121	0.235	0.125

Fitted Residuals (continued)

	fpcY11a	fpcY12a	fpcY13a	ak6Y19	ak7Y20	ak9Y22
fpcY11a	0.000					
fpcY12a	-0.040	0.000				
fpcY13a	-0.041	-0.068	0.000			
ak6Y19	-0.123	0.057	0.036	0.000		
ak7Y20	-0.203	-0.123	-0.221	-0.060	0.000	
ak9Y22	-0.192	-0.030	-0.088	-0.158	-0.365	0.000
ak10Y23	-0.187	-0.057	-0.100	-0.189	-0.242	-0.211
ew11Y34	0.005	-0.027	0.007	-0.093	-0.003	-0.067
ew12Y35	-0.032	-0.010	0.033	0.106	-0.001	0.011
ew24Y38	0.040	0.130	0.088	0.043	-0.049	0.256
pa14Y25	-0.228	-0.149	-0.204	-0.222	-0.342	-0.013
pa15Y26	-0.226	-0.161	-0.119	-0.188	-0.223	0.009
pa16Y27	-0.032	-0.036	0.053	-0.048	-0.282	0.068

Fitted Residuals (continued)

	ak10Y23	ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26
ak10Y23	0.000					
ew11Y34	-0.021	0.000				
ew12Y35	0.159	0.080	0.000			
ew24Y38	0.044	0.032	0.177	0.000		
pa14Y25	-0.002	0.040	0.246	0.218	0.000	
pa15Y26	0.035	0.058	0.218	0.213	-0.053	0.000
pa16Y27	0.029	0.135	0.154	0.226	0.139	0.079

Fitted Residuals (continued)

	pa16Y27
pa16Y27	0.000

Summary Statistics for Fitted Residuals

```
Smallest Fitted Residual =   -0.365
  Median Fitted Residual =    0.007
 Largest Fitted Residual =    0.261
```

Stemleaf Plot

```
- 3|7
- 3|4
- 2|8
- 2|43322211100
- 1|9999665
- 1|33222200
- 0|99988776666555555
- 0|44444444333333333321111000000000000000000000000
  0|11111122222233333333334444444444
  0|55555556666677777778888888999
  1|0111112223344
  1|555566668889
  2|11222234
  2|566
```

10

Standardized Residuals

	pcr17X2	pcr19X4	pcr20X5	pcr21X6	ipcY6a	ipcY7a
pcr17X2	- -					
pcr19X4	0.182	- -				
pcr20X5	-1.260	-3.542	- -			
pcr21X6	-0.689	-2.407	-2.209	- -		
ipcY6a	1.208	1.289	1.703	1.350	- -	
ipcY7a	-0.873	0.308	1.181	1.528	-1.024	- -
fpcY11a	0.467	1.100	-0.189	0.806	-0.660	-1.844
fpcY12a	0.138	0.403	0.462	1.581	-0.831	-1.296
fpcY13a	1.693	1.800	0.950	2.860	-1.146	-0.198
ak6Y19	0.095	-0.841	0.899	0.920	-1.245	-0.600
ak7Y20	1.037	1.410	1.594	2.347	-2.019	-2.119
ak9Y22	-0.392	0.605	0.618	1.686	0.248	-0.922
ak10Y23	0.407	1.271	0.839	0.655	-0.017	-0.447
ew11Y34	0.431	0.318	0.555	0.305	1.383	1.467
ew12Y35	0.687	1.784	0.310	0.804	3.153	1.167
ew24Y38	0.345	-0.417	-1.675	-0.484	2.463	0.593
pa14Y25	0.826	0.783	2.226	2.379	1.136	-2.276
pa15Y26	0.518	2.552	1.909	3.094	1.737	-0.934
pa16Y27	0.372	0.269	2.168	1.548	3.423	2.070

Standardized Residuals (continued)

	fpcY11a	fpcY12a	fpcY13a	ak6Y19	ak7Y20	ak9Y22
fpcY11a	- -					
fpcY12a	-1.664	- -				
fpcY13a	-1.717	-2.291	- -			
ak6Y19	-1.450	0.762	0.515	- -		
ak7Y20	-1.750	-1.091	-2.497	-1.028	- -	
ak9Y22	-2.894	-0.465	-1.318	-2.750	-3.871	- -
ak10Y23	-3.191	-0.893	-1.566	-2.755	-2.618	-3.303
ew11Y34	0.101	-0.472	0.131	-1.043	-0.031	-0.879
ew12Y35	-0.487	-0.156	0.488	1.134	-0.005	0.134
ew24Y38	0.630	2.073	1.385	0.461	-0.436	3.349
pa14Y25	-4.280	-2.574	-3.628	-2.752	-3.219	-0.242
pa15Y26	-3.757	-2.717	-1.934	-2.364	-2.197	0.179
pa16Y27	-0.495	-0.546	0.815	-0.497	-2.485	0.833

Standardized Residuals (continued)

	ak10Y23	ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26
ak10Y23	- -					
ew11Y34	-0.269	- -				
ew12Y35	1.955	1.623	- -			
ew24Y38	0.535	0.614	2.479	- -		
pa14Y25	-0.032	0.590	3.233	2.885	- -	
pa15Y26	0.607	0.814	2.657	2.623	-1.509	- -
pa16Y27	0.352	1.536	1.878	2.907	2.240	1.129

Standardized Residuals (continued)

	pa16Y27
pa16Y27	- -

Summary Statistics for Standardized Residuals

```
Smallest Standardized Residual =   -4.280
  Median Standardized Residual =    0.132
 Largest Standardized Residual =    3.423
```

Stemleaf Plot

```
- 4|3
- 3|9865
- 3|322
- 2|988776655
- 2|44332210
- 1|98777765
- 1|4333211000
- 0|99999887765555555
- 0|444432222000000000000000000000
  0|1111122233333344444
  0|55555556666666677888888888999
  1|01111222334444
  1|555566677778899
  2|01122234
  2|55667999
  3|12234
```

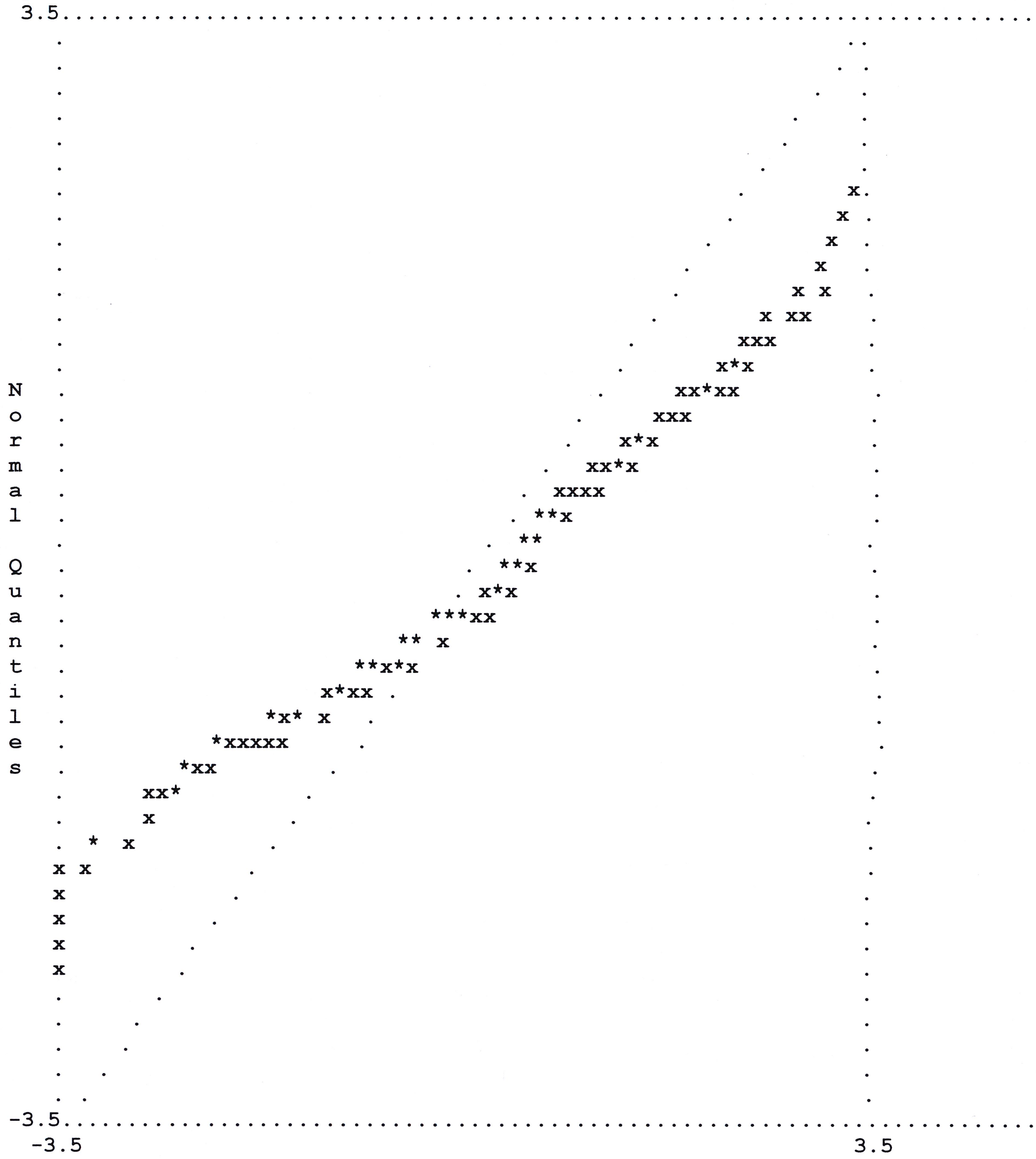
Largest Negative Standardized Residuals

Residual for	pcr20X5	and	pcr19X4	-3.542
Residual for	ak9Y22	and	fpcY11a	-2.894
Residual for	ak9Y22	and	ak6Y19	-2.750
Residual for	ak9Y22	and	ak7Y20	-3.871
Residual for	ak10Y23	and	fpcY11a	-3.191
Residual for	ak10Y23	and	ak6Y19	-2.755
Residual for	ak10Y23	and	ak7Y20	-2.618
Residual for	ak10Y23	and	ak9Y22	-3.303
Residual for	pa14Y25	and	fpcY11a	-4.280
Residual for	pa14Y25	and	fpcY13a	-3.628
Residual for	pa14Y25	and	ak6Y19	-2.752
Residual for	pa14Y25	and	ak7Y20	-3.219
Residual for	pa15Y26	and	fpcY11a	-3.757
Residual for	pa15Y26	and	fpcY12a	-2.717

Largest Positive Standardized Residuals

Residual for	fpcY13a	and	pcr21X6	2.860
Residual for	ew12Y35	and	ipcY6a	3.153
Residual for	ew24Y38	and	ak9Y22	3.349
Residual for	pa14Y25	and	ew12Y35	3.233
Residual for	pa14Y25	and	ew24Y38	2.885
Residual for	pa15Y26	and	pcr21X6	3.094
Residual for	pa15Y26	and	ew12Y35	2.657
Residual for	pa15Y26	and	ew24Y38	2.623
Residual for	pa16Y27	and	ipcY6a	3.423
Residual for	pa16Y27	and	ew24Y38	2.907

Qplot of Standardized Residuals



Modification Indices and Expected Change

Modification Indices for LAMBDA-X

	PCRQ	IPCLI	FPCLI	AK	EW	PA
pcr17X2	- -	2.751	1.525	0.551	4.809	0.003
pcr19X4	- -	0.812	0.533	8.452	4.203	5.956
pcr20X5	- -	3.097	0.002	3.036	0.563	3.764
pcr21X6	- -	0.138	0.878	0.016	0.825	0.122
ipcY6a	1.657	- -	0.007	0.813	2.939	5.461
ipcY7a	1.657	- -	0.007	0.813	2.939	5.461
fpcY11a	0.281	1.252	- -	7.229	0.167	2.012
fpcY12a	0.438	2.081	- -	5.692	0.065	2.562
fpcY13a	0.017	0.189	- -	0.489	0.043	0.008
ak6Y19	1.567	7.778	18.565	- -	0.661	3.757
ak7Y20	3.903	6.656	6.993	- -	0.294	8.456
ak9Y22	0.551	0.021	0.407	- -	4.303	12.043
ak10Y23	0.013	2.140	8.126	- -	3.440	2.538
ew11Y34	1.640	0.643	1.994	1.684	- -	8.905
ew12Y35	0.728	3.012	0.545	1.146	- -	5.877
ew24Y38	5.863	0.361	1.388	0.319	- -	2.851
pa14Y25	3.856	6.223	1.127	0.826	0.374	- -
pa15Y26	1.141	2.053	0.716	0.495	0.007	- -
pa16Y27	9.552	7.559	0.475	0.231	4.744	- -

Expected Change for LAMBDA-X

	PCRQ	IPCLI	FPCLI	AK	EW	PA
pcr17X2	- -	-0.067	-0.048	0.034	0.109	-0.003
pcr19X4	- -	-0.034	-0.030	-0.122	-0.094	-0.113
pcr20X5	- -	0.048	0.001	0.056	-0.029	0.063
pcr21X6	- -	-0.010	0.023	-0.004	0.030	-0.011
ipcY6a	0.063	- -	0.010	0.050	0.090	0.151
ipcY7a	-0.133	- -	-0.020	-0.107	-0.191	-0.321
fpcY11a	-0.021	-0.062	- -	-0.097	0.016	-0.052
fpcY12a	0.025	0.068	- -	0.089	-0.010	0.065
fpcY13a	-0.005	-0.023	- -	0.028	-0.009	0.004
ak6Y19	-0.063	0.178	0.290	- -	0.051	-0.204
ak7Y20	0.102	-0.229	-0.204	- -	-0.044	-0.335
ak9Y22	-0.039	0.009	0.044	- -	-0.149	0.367
ak10Y23	0.007	-0.100	-0.170	- -	0.134	0.197
ew11Y34	0.249	-0.142	-0.230	-0.259	- -	-0.518
ew12Y35	0.047	0.094	0.041	0.064	- -	0.137
ew24Y38	-0.140	-0.032	0.060	0.032	- -	0.093
pa14Y25	-0.107	-0.165	-0.067	-0.177	-0.040	- -
pa15Y26	0.062	0.099	0.057	0.157	-0.006	- -
pa16Y27	0.201	0.166	0.047	0.061	0.157	- -

Standardized Expected Change for LAMBDA-X

	PCRQ	IPCLI	FPCLI	AK	EW	PA
pcr17X2	- -	-0.067	-0.048	0.034	0.109	-0.003
pcr19X4	- -	-0.034	-0.030	-0.122	-0.094	-0.113
pcr20X5	- -	0.048	0.001	0.056	-0.029	0.063

pcr21X6	- -	-0.010	0.023	-0.004	0.030	-0.011
ipcY6a	0.063	- -	0.010	0.050	0.090	0.151
ipcY7a	-0.133	- -	-0.020	-0.107	-0.191	-0.321
fpcY11a	-0.021	-0.062	- -	-0.097	0.016	-0.052
fpcY12a	0.025	0.068	- -	0.089	-0.010	0.065
fpcY13a	-0.005	-0.023	- -	0.028	-0.009	0.004
ak6Y19	-0.063	0.178	0.290	- -	0.051	-0.204
ak7Y20	0.102	-0.229	-0.204	- -	-0.044	-0.335
ak9Y22	-0.039	0.009	0.044	- -	-0.149	0.367
ak10Y23	0.007	-0.100	-0.170	- -	0.134	0.197
ew11Y34	0.249	-0.142	-0.230	-0.259	- -	-0.518
ew12Y35	0.047	0.094	0.041	0.064	- -	0.137
ew24Y38	-0.140	-0.032	0.060	0.032	- -	0.093
pa14Y25	-0.107	-0.165	-0.067	-0.177	-0.040	- -
pa15Y26	0.062	0.099	0.057	0.157	-0.006	- -
pa16Y27	0.201	0.166	0.047	0.061	0.157	- -

Completely Standardized Expected Change for LAMBDA-X

	PCRQ	IPCLI	FPCLI	AK	EW	PA
pcr17X2	- -	-0.067	-0.048	0.034	0.109	-0.003
pcr19X4	- -	-0.034	-0.030	-0.122	-0.094	-0.113
pcr20X5	- -	0.048	0.001	0.056	-0.029	0.063
pcr21X6	- -	-0.010	0.023	-0.004	0.030	-0.011
ipcY6a	0.063	- -	0.010	0.050	0.090	0.151
ipcY7a	-0.133	- -	-0.020	-0.107	-0.191	-0.321
fpcY11a	-0.021	-0.062	- -	-0.097	0.016	-0.052
fpcY12a	0.025	0.068	- -	0.089	-0.010	0.065
fpcY13a	-0.005	-0.023	- -	0.028	-0.009	0.004
ak6Y19	-0.063	0.178	0.290	- -	0.051	-0.204
ak7Y20	0.102	-0.229	-0.204	- -	-0.044	-0.335
ak9Y22	-0.039	0.009	0.044	- -	-0.149	0.367
ak10Y23	0.007	-0.100	-0.170	- -	0.134	0.197
ew11Y34	0.249	-0.142	-0.230	-0.259	- -	-0.518
ew12Y35	0.047	0.094	0.041	0.064	- -	0.137
ew24Y38	-0.140	-0.032	0.060	0.032	- -	0.093
pa14Y25	-0.107	-0.165	-0.067	-0.177	-0.040	- -
pa15Y26	0.062	0.099	0.057	0.157	-0.006	- -
pa16Y27	0.201	0.166	0.047	0.061	0.157	- -

No Non-Zero Modification Indices for PHI

Modification Indices for THETA-DELTA

	pcr17X2	pcr19X4	pcr20X5	pcr21X6	ipcY6a	ipcY7a
pcr17X2	- -					
pcr19X4	1.472	- -				
pcr20X5	0.027	1.344	- -			
pcr21X6	0.790	0.084	3.068	- -		
ipcY6a	4.526	0.018	0.254	0.350	- -	
ipcY7a	6.904	0.000	3.952	0.997	- -	- -
fpcY11a	0.051	1.170	0.901	0.451	0.203	0.849
fpcY12a	1.635	2.695	0.337	0.007	2.220	0.196
fpcY13a	0.296	5.936	1.461	7.795	2.395	0.105
ak6Y19	5.036	3.086	0.477	0.130	0.096	1.480
ak7Y20	0.041	5.418	0.493	6.394	0.231	6.519
ak9Y22	7.060	3.184	3.007	1.431	0.319	0.082
ak10Y23	11.862	0.232	1.306	0.361	4.955	2.597

ew11Y34	0.300	2.121	0.434	0.077	0.490	0.653
ew12Y35	0.262	0.691	8.490	5.716	1.677	1.770
ew24Y38	7.662	0.059	12.117	0.118	6.118	5.270
pa14Y25	2.420	2.264	5.602	7.198	1.987	7.050
pa15Y26	5.778	1.281	0.791	1.946	2.566	0.010
pa16Y27	0.204	2.114	8.082	0.000	0.946	8.653

Modification Indices for THETA-DELTA (continued)

	fpcY11a	fpcY12a	fpcY13a	ak6Y19	ak7Y20	ak9Y22
fpcY11a	- -					
fpcY12a	0.208	- -				
fpcY13a	3.199	1.576	- -			
ak6Y19	4.145	6.587	10.857	- -		
ak7Y20	2.625	1.191	3.067	14.270	- -	
ak9Y22	0.002	1.480	1.809	5.383	2.712	- -
ak10Y23	20.395	0.805	5.553	0.069	0.260	3.244
ew11Y34	5.644	2.129	1.821	2.677	2.080	2.436
ew12Y35	0.288	4.301	2.928	0.765	0.890	8.175
ew24Y38	1.192	4.305	0.274	1.188	1.015	5.334
pa14Y25	4.913	0.351	10.264	0.045	10.666	7.950
pa15Y26	1.920	0.001	3.082	6.184	1.533	0.617
pa16Y27	0.824	8.899	1.605	0.079	16.047	0.819

Modification Indices for THETA-DELTA (continued)

	ak10Y23	ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26
ak10Y23	- -					
ew11Y34	6.140	- -				
ew12Y35	0.060	0.323	- -			
ew24Y38	7.959	0.556	3.124	- -		
pa14Y25	0.996	3.957	12.236	1.016	- -	
pa15Y26	1.781	0.354	1.004	0.739	0.675	- -
pa16Y27	3.260	4.559	0.843	2.945	0.959	0.035

Modification Indices for THETA-DELTA (continued)

	pa16Y27
pa16Y27	- -

Expected Change for THETA-DELTA

	pcr17X2	pcr19X4	pcr20X5	pcr21X6	ipcY6a	ipcY7a
pcr17X2	- -					
pcr19X4	0.041	- -				
pcr20X5	0.004	-0.041	- -			
pcr21X6	-0.024	-0.010	0.092	- -		
ipcY6a	0.080	-0.005	0.014	-0.014	- -	
ipcY7a	-0.091	0.000	0.048	-0.024	- -	- -
fpcY11a	0.006	0.032	-0.020	-0.013	-0.013	0.028
fpcY12a	-0.033	0.047	0.012	-0.002	0.044	-0.012
fpcY13a	0.014	-0.067	-0.023	0.058	-0.051	-0.010
ak6Y19	0.096	-0.069	-0.022	-0.009	0.012	0.050
ak7Y20	-0.011	-0.101	0.027	0.079	0.022	-0.122
ak9Y22	-0.107	0.075	0.069	-0.035	-0.023	0.012
ak10Y23	0.146	-0.022	-0.040	-0.019	-0.109	0.071
ew11Y34	0.027	-0.067	0.026	0.009	0.038	-0.074

ew12Y35	0.022	0.038	-0.108	0.078	0.066	0.057
ew24Y38	0.113	0.011	-0.119	0.012	0.124	-0.100
pa14Y25	0.065	-0.057	0.076	-0.074	0.060	-0.114
pa15Y26	-0.103	0.035	-0.031	0.037	0.069	0.005
pa16Y27	-0.020	-0.071	0.112	0.000	0.051	0.135

Expected Change for THETA-DELTA (continued)

	fpcY11a	fpcY12a	fpcY13a	ak6Y19	ak7Y20	ak9Y22
fpcY11a	- -					
fpcY12a	-0.022	- -				
fpcY13a	0.090	-0.055	- -			
ak6Y19	-0.064	0.087	0.130	- -		
ak7Y20	0.056	-0.042	-0.074	0.296	- -	
ak9Y22	0.001	0.039	-0.042	-0.101	0.080	- -
ak10Y23	-0.125	0.030	0.079	-0.013	0.028	-0.089
ew11Y34	0.093	-0.059	-0.055	0.090	-0.101	-0.104
ew12Y35	-0.018	-0.079	0.062	0.046	-0.054	-0.149
ew24Y38	-0.037	0.076	0.019	-0.059	-0.063	0.120
pa14Y25	0.060	0.022	-0.099	-0.008	-0.165	0.131
pa15Y26	-0.043	0.001	0.057	-0.102	0.060	0.039
pa16Y27	0.030	-0.108	0.050	-0.013	-0.227	0.047

Expected Change for THETA-DELTA (continued)

	ak10Y23	ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26
ak10Y23	- -					
ew11Y34	0.162	- -				
ew12Y35	0.013	-0.112	- -			
ew24Y38	-0.169	-0.162	0.116	- -		
pa14Y25	0.048	-0.121	0.188	0.052	- -	
pa15Y26	0.065	-0.038	0.052	0.044	-0.161	- -
pa16Y27	0.097	0.156	0.059	0.103	0.062	-0.012

Expected Change for THETA-DELTA (continued)

	pa16Y27
pa16Y27	- -

Completely Standardized Expected Change for THETA-DELTA

	pcr17X2	pcr19X4	pcr20X5	pcr21X6	ipcY6a	ipcY7a
pcr17X2	- -					
pcr19X4	0.041	- -				
pcr20X5	0.004	-0.041	- -			
pcr21X6	-0.024	-0.010	0.092	- -		
ipcY6a	0.080	-0.005	0.014	-0.014	- -	
ipcY7a	-0.091	0.000	0.048	-0.024	- -	- -
fpcY11a	0.006	0.032	-0.020	-0.013	-0.013	0.028
fpcY12a	-0.033	0.047	0.012	-0.002	0.044	-0.012
fpcY13a	0.014	-0.067	-0.023	0.058	-0.051	-0.010
ak6Y19	0.096	-0.069	-0.022	-0.009	0.012	0.050
ak7Y20	-0.011	-0.101	0.027	0.079	0.022	-0.122
ak9Y22	-0.107	0.075	0.069	-0.035	-0.023	0.012
ak10Y23	0.146	-0.022	-0.040	-0.019	-0.109	0.071
ew11Y34	0.027	-0.067	0.026	0.009	0.038	-0.074
ew12Y35	0.022	0.038	-0.108	0.078	0.066	0.057

ew24Y38	0.113	0.011	-0.119	0.012	0.124	-0.100
pa14Y25	0.065	-0.057	0.076	-0.074	0.060	-0.114
pa15Y26	-0.103	0.035	-0.031	0.037	0.069	0.005
pa16Y27	-0.020	-0.071	0.112	0.000	0.051	0.135

Completely Standardized Expected Change for THETA-DELTA (continued)

	fpcY11a	fpcY12a	fpcY13a	ak6Y19	ak7Y20	ak9Y22
fpcY11a	- -					
fpcY12a	-0.022	- -				
fpcY13a	0.090	-0.055	- -			
ak6Y19	-0.064	0.087	0.130	- -		
ak7Y20	0.056	-0.042	-0.074	0.296	- -	
ak9Y22	0.001	0.039	-0.042	-0.101	0.080	- -
ak10Y23	-0.125	0.030	0.079	-0.013	0.028	-0.089
ew11Y34	0.093	-0.059	-0.055	0.090	-0.101	-0.104
ew12Y35	-0.018	-0.079	0.062	0.046	-0.054	-0.149
ew24Y38	-0.037	0.076	0.019	-0.059	-0.063	0.120
pa14Y25	0.060	0.022	-0.099	-0.008	-0.165	0.131
pa15Y26	-0.043	0.001	0.057	-0.102	0.060	0.039
pa16Y27	0.030	-0.108	0.050	-0.013	-0.227	0.047

Completely Standardized Expected Change for THETA-DELTA (continued)

	ak10Y23	ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26
ak10Y23	- -					
ew11Y34	0.162	- -				
ew12Y35	0.013	-0.112	- -			
ew24Y38	-0.169	-0.162	0.116	- -		
pa14Y25	0.048	-0.121	0.188	0.052	- -	
pa15Y26	0.065	-0.038	0.052	0.044	-0.161	- -
pa16Y27	0.097	0.156	0.059	0.103	0.062	-0.012

Completely Standardized Expected Change for THETA-DELTA (continued)

	pa16Y27
pa16Y27	- -

Maximum Modification Index is 20.40 for Element (13, 7) of THETA-DELTA

Standardized Solution

LAMBDA-X

	PCRQ	IPCLI	FPCLI	AK	EW	PA
pcr17X2	0.721	- -	- -	- -	- -	- -
pcr19X4	0.874	- -	- -	- -	- -	- -
pcr20X5	0.977	- -	- -	- -	- -	- -
pcr21X6	0.972	- -	- -	- -	- -	- -
ipcY6a	- -	0.414	- -	- -	- -	- -
ipcY7a	- -	0.879	- -	- -	- -	- -
fpcY11a	- -	- -	0.881	- -	- -	- -
fpcY12a	- -	- -	0.809	- -	- -	- -
fpcY13a	- -	- -	0.812	- -	- -	- -
ak6Y19	- -	- -	- -	0.921	- -	- -
ak7Y20	- -	- -	- -	0.886	- -	- -
ak9Y22	- -	- -	- -	0.894	- -	- -
ak10Y23	- -	- -	- -	0.770	- -	- -
ew11Y34	- -	- -	- -	- -	0.990	- -
ew12Y35	- -	- -	- -	- -	0.226	- -
ew24Y38	- -	- -	- -	- -	0.239	- -
pa14Y25	- -	- -	- -	- -	- -	0.846
pa15Y26	- -	- -	- -	- -	- -	0.889
pa16Y27	- -	- -	- -	- -	- -	0.299

PHI

	PCRQ	IPCLI	FPCLI	AK	EW	PA
PCRQ	1.000					
IPCLI	0.039	1.000				
FPCLI	-0.097	0.558	1.000			
AK	-0.239	0.411	0.358	1.000		
EW	0.055	-0.076	-0.005	0.280	1.000	
PA	-0.233	0.297	0.388	0.749	0.139	1.000

Completely Standardized Solution

LAMBDA-X

	PCRQ	IPCLI	FPCLI	AK	EW	PA
pcr17X2	0.721	- -	- -	- -	- -	- -
pcr19X4	0.874	- -	- -	- -	- -	- -
pcr20X5	0.977	- -	- -	- -	- -	- -
pcr21X6	0.972	- -	- -	- -	- -	- -
ipcY6a	- -	0.414	- -	- -	- -	- -
ipcY7a	- -	0.879	- -	- -	- -	- -
fpcY11a	- -	- -	0.881	- -	- -	- -
fpcY12a	- -	- -	0.809	- -	- -	- -
fpcY13a	- -	- -	0.812	- -	- -	- -
ak6Y19	- -	- -	- -	0.921	- -	- -
ak7Y20	- -	- -	- -	0.886	- -	- -
ak9Y22	- -	- -	- -	0.894	- -	- -
ak10Y23	- -	- -	- -	0.770	- -	- -
ew11Y34	- -	- -	- -	- -	0.990	- -
ew12Y35	- -	- -	- -	- -	0.226	- -
ew24Y38	- -	- -	- -	- -	0.239	- -
pa14Y25	- -	- -	- -	- -	- -	0.846
pa15Y26	- -	- -	- -	- -	- -	0.889
pa16Y27	- -	- -	- -	- -	- -	0.299

PHI

	PCRQ	IPCLI	FPCLI	AK	EW	PA
PCRQ	1.000					
IPCLI	0.039	1.000				
FPCLI	-0.097	0.558	1.000			
AK	-0.239	0.411	0.358	1.000		
EW	0.055	-0.076	-0.005	0.280	1.000	
PA	-0.233	0.297	0.388	0.749	0.139	1.000

THETA-DELTA

pcr17X2	pcr19X4	pcr20X5	pcr21X6	ipcY6a	ipcY7a
0.481	0.236	0.046	0.055	0.829	0.227

THETA-DELTA (continued)

fpcY11a	fpcY12a	fpcY13a	ak6Y19	ak7Y20	ak9Y22
0.224	0.346	0.341	0.151	0.215	0.201

THETA-DELTA (continued)

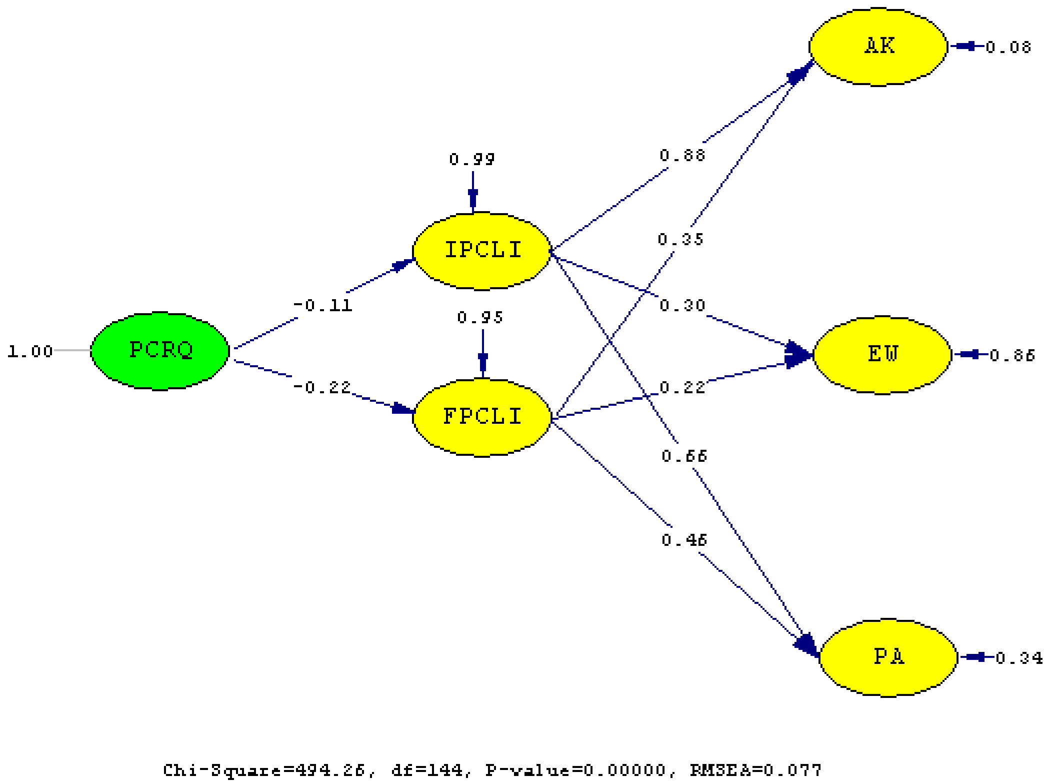
ak10Y23	ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26
0.407	0.019	0.949	0.943	0.284	0.209

THETA-DELTA (continued)

pa16Y27
0.910

Time used: 0.781 Seconds

20



1.00
PCRQ
-0.11
-0.22
0.99
IPCLI
0.95
FPCLI
0.88
0.35
0.30
0.22
0.66
0.46
AK
0.08
EW
0.86
PA
0.34
Chi-Square=494.26, df=144, P-value=0.00000, RMSEA=0.077

DATE: 3/19/2014
TIME: 11:14

L I S R E L 8.80

BY

Karl G. Jöreskog and Dag Sörbom

The following lines were read from file **E:\9SEM2-PCLI_1403\PCLI_Model-SEM.LS8:**

```
!PCLI_Model: LISREL Run 2
!Test Six-Factor PCLI Structural Model: SEM Model M2(19-item)
 DA NI=19 NO=411 MA=PM
 LA
 pcr17X2 pcr19X4 pcr20X5 pcr21X6 ipcY6a ipcY7a fpcY11a fpcY12a fpcY13a ak6Y19 ak7Y20 ak9Y22
ak10Y23 ew11Y34 ew12Y35 ew24Y38 pa14Y25 pa15Y26 pa16Y27
 PM FI=PCLI-Model.PM
 AC FI=PCLI-Model.ACP
 SE
 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 1 2 3 4
 MO NY=15 NX=4 NE=5 NK=1 AP=6 LY=FU,FI LX=FU,FI BE=FU,FI GA=FU,FI PH=SY,FR PS=DI,FR TE=DI,FR
TD=DI,FR
 FR LX 1 1 LX 2 1 LX 3 1 LX 4 1
 FR LY 1 1 LY 2 1 LY 3 2 LY 4 2 LY 5 2
 FR LY 6 3 LY 7 3 LY 8 3 LY 9 3
 FR LY 10 4 LY 11 4 LY 12 4
 FR LY 13 5 LY 14 5 LY 15 5
 FR BE 3 1 BE 4 1 BE 5 1 BE 3 2 BE 4 2 BE 5 2
 FR GA 1 1 GA 2 1
 LE
 IPCLI FPCLI AK EW PA
 LK
 PCRQ
 CO PAR(1)=GA(1,1)*BE(3,1)
 CO PAR(2)=GA(2,1)*BE(3,2)
 CO PAR(3)=GA(1,1)*BE(4,1)
 CO PAR(4)=GA(2,1)*BE(4,2)
 CO PAR(5)=GA(1,1)*BE(5,1)
 CO PAR(6)=GA(2,1)*BE(5,2)
 PD
 OU ME=WL ND=3 SC RS MI EF
```

!PCLI Model: LISREL Run 2

```
Number of Input Variables 19
Number of Y - Variables   15
Number of X - Variables    4
Number of ETA - Variables  5
Number of KSI - Variables  1
Number of Observations   411
```

!PCLI Model: LISREL Run 2

Correlation Matrix

	ipcY6a	ipcY7a	fpcY11a	fpcY12a	fpcY13a	ak6Y19
ipcY6a	1.000					
ipcY7a	0.323	1.000				
fpcY11a	0.174	0.357	1.000			
fpcY12a	0.149	0.346	0.672	1.000		
fpcY13a	0.130	0.392	0.675	0.589	1.000	
ak6Y19	0.054	0.291	0.168	0.324	0.304	1.000
ak7Y20	-0.056	0.111	0.076	0.133	0.037	0.756
ak9Y22	0.169	0.271	0.090	0.228	0.172	0.666
ak10Y23	0.130	0.252	0.056	0.166	0.124	0.521
ew11Y34	0.065	0.002	0.001	-0.031	0.003	0.162
ew12Y35	0.203	0.062	-0.032	-0.011	0.032	0.164
ew24Y38	0.155	0.021	0.039	0.130	0.087	0.104
pa14Y25	0.176	0.101	0.061	0.117	0.063	0.362
pa15Y26	0.227	0.178	0.078	0.118	0.161	0.426
pa16Y27	0.272	0.203	0.071	0.058	0.147	0.159
pcr17X2	0.082	-0.016	-0.036	-0.050	0.027	-0.151
pcr19X4	0.106	0.048	-0.006	-0.043	0.042	-0.274
pcr20X5	0.127	0.089	-0.094	-0.051	-0.026	-0.126
pcr21X6	0.099	0.104	-0.041	0.003	0.074	-0.135

Correlation Matrix (continued)

	ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35	ew24Y38
ak7Y20	1.000					
ak9Y22	0.427	1.000				
ak10Y23	0.441	0.477	1.000			
ew11Y34	0.242	0.180	0.192	1.000		
ew12Y35	0.055	0.068	0.208	0.304	1.000	
ew24Y38	0.010	0.316	0.095	0.268	0.231	1.000
pa14Y25	0.219	0.554	0.487	0.156	0.273	0.246
pa15Y26	0.367	0.605	0.549	0.180	0.246	0.243
pa16Y27	-0.084	0.268	0.202	0.176	0.163	0.236
pcr17X2	-0.039	-0.180	-0.103	0.066	0.057	0.033
pcr19X4	-0.006	-0.135	-0.047	0.071	0.158	-0.023
pcr20X5	-0.017	-0.157	-0.105	0.090	0.037	-0.120
pcr21X6	0.055	-0.083	-0.128	0.071	0.075	-0.025

Correlation Matrix (continued)

	pa14Y25	pa15Y26	pa16Y27	pcr17X2	pcr19X4	pcr20X5
pa14Y25	1.000					
pa15Y26	0.700	1.000				
pa16Y27	0.393	0.346	1.000			
pcr17X2	-0.091	-0.114	-0.024	1.000		
pcr19X4	-0.111	0.038	-0.038	0.637	1.000	
pcr20X5	-0.032	-0.057	0.111	0.646	0.728	1.000
pcr21X6	-0.029	0.019	0.053	0.669	0.759	0.920

Correlation Matrix (continued)

	pcr21X6
pcr21X6	1.000

!PCLI Model: LISREL Run 2

Parameter Specifications

LAMBDA-Y

	IPCLI	FPCLI	AK	EW	PA
ipcY6a	0	0	0	0	0
ipcY7a	1	0	0	0	0
fpcY11a	0	0	0	0	0
fpcY12a	0	2	0	0	0
fpcY13a	0	3	0	0	0
ak6Y19	0	0	0	0	0
ak7Y20	0	0	4	0	0
ak9Y22	0	0	5	0	0
ak10Y23	0	0	6	0	0
ew11Y34	0	0	0	0	0
ew12Y35	0	0	0	7	0
ew24Y38	0	0	0	8	0
pa14Y25	0	0	0	0	0
pa15Y26	0	0	0	0	9
pa16Y27	0	0	0	0	10

LAMBDA-X

	PCRQ
pcr17X2	11
pcr19X4	12
pcr20X5	13
pcr21X6	14

BETA

	IPCLI	FPCLI	AK	EW	PA
IPCLI	0	0	0	0	0
FPCLI	0	0	0	0	0
AK	15	16	0	0	0
EW	17	18	0	0	0
PA	19	20	0	0	0

GAMMA

	PCRQ
IPCLI	21
FPCLI	22
AK	0
EW	0
PA	0

PSI

IPCLI	FPCLI	AK	EW	PA
23	24	25	26	27

THETA-EPS

ipcY6a	ipcY7a	fpcY11a	fpcY12a	fpcY13a	ak6Y19
28	29	30	31	32	33

THETA-EPS (continued)

ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35	ew24Y38
34	35	36	37	38	39

THETA-EPS (continued)

pa14Y25	pa15Y26	pa16Y27
40	41	42

THETA-DELTA

pcr17X2	pcr19X4	pcr20X5	pcr21X6
43	44	45	46

!PCLI Model: LISREL Run 2

Number of Iterations = 36

LISREL Estimates (Weighted Least Squares)

LAMBDA-Y

	IPCLI	FPCLI	AK	EW	PA
ipcY6a	0.421	- -	- -	- -	- -
ipcY7a	0.475	- -	- -	- -	- -
	(0.054)				
	8.760				
fpcY11a	- -	0.806	- -	- -	- -
fpcY12a	- -	0.783	- -	- -	- -
		(0.035)			
		22.401			
fpcY13a	- -	0.748	- -	- -	- -
		(0.034)			
		22.214			
ak6Y19	- -	- -	0.905	- -	- -
ak7Y20	- -	- -	0.981	- -	- -
			(0.058)		
			17.008		
ak9Y22	- -	- -	0.930	- -	- -
			(0.042)		
			22.314		
ak10Y23	- -	- -	0.785	- -	- -
			(0.039)		
			19.956		
ew11Y34	- -	- -	- -	0.640	- -
ew12Y35	- -	- -	- -	0.365	- -
				(0.099)	
				3.692	
ew24Y38	- -	- -	- -	0.502	- -
				(0.123)	
				4.077	
pa14Y25	- -	- -	- -	- -	0.906
pa15Y26	- -	- -	- -	- -	0.877
					(0.061)
					14.421
pa16Y27	- -	- -	- -	- -	0.275
					(0.052)
					5.316

LAMBDA-X

	PCRQ
pcr17X2	0.696
	(0.031)
	22.445
pcr19X4	0.824
	(0.028)
	29.646
pcr20X5	0.980
	(0.014)
	69.236
pcr21X6	0.962
	(0.014)
	70.743

BETA

	IPCLI	FPCLI	AK	EW	PA
IPCLI	- -	- -	- -	- -	- -
FPCLI	- -	- -	- -	- -	- -
AK	0.881	0.354	- -	- -	- -
	(0.113)	(0.047)			
	7.821	7.525			
EW	0.298	0.221	- -	- -	- -
	(0.081)	(0.067)			
	3.698	3.314			
PA	0.659	0.461	- -	- -	- -
	(0.086)	(0.048)			
	7.640	9.666			

GAMMA

	PCRQ
IPCLI	-0.109
	(0.043)
	-2.554
FPCLI	-0.224
	(0.042)
	-5.294
AK	- -
EW	- -
PA	- -

Covariance Matrix of ETA and KSI

	IPCLI	FPCLI	AK	EW	PA	PCRQ
IPCLI	1.000					
FPCLI	0.024	1.000				
AK	0.889	0.375	1.000			
EW	0.304	0.228	0.348	1.000		
PA	0.670	0.477	0.759	0.305	1.000	
PCRQ	-0.109	-0.224	-0.175	-0.082	-0.175	1.000

PHI

PCRQ
1.000

PSI

Note: This matrix is diagonal.

IPCLI	FPCLI	AK	EW	PA
0.988	0.950	0.084	0.859	0.339
(0.207)	(0.054)	(0.076)	(0.284)	(0.076)
4.768	17.514	1.096	3.029	4.464

Squared Multiple Correlations for Structural Equations

IPCLI	FPCLI	AK	EW	PA
0.012	0.050	0.916	0.141	0.661

Squared Multiple Correlations for Reduced Form

IPCLI	FPCLI	AK	EW	PA
0.012	0.050	0.031	0.007	0.031

Reduced Form

	PCRQ
IPCLI	-0.109
	(0.043)
	-2.554
FPCLI	-0.224
	(0.042)
	-5.294
AK	-0.175
	(0.037)
	-4.781
EW	-0.082
	(0.023)
	-3.529
PA	-0.175
	(0.033)
	-5.243

THETA-EPS

ipcY6a	ipcY7a	fpcY11a	fpcY12a	fpcY13a	ak6Y19
0.823	0.775	0.350	0.388	0.440	0.181
(0.062)	(0.062)	(0.061)	(0.064)	(0.064)	(0.068)
13.341	12.482	5.759	6.079	6.917	2.676

THETA-EPS (continued)

ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35	ew24Y38
0.037	0.135	0.384	0.591	0.867	0.748
(0.094)	(0.075)	(0.075)	(0.137)	(0.073)	(0.093)
0.395	1.815	5.098	4.318	11.945	8.079

THETA-EPS (continued)

pa14Y25	pa15Y26	pa16Y27
0.179	0.231	0.924
(0.089)	(0.080)	(0.057)
2.008	2.869	16.336

Squared Multiple Correlations for Y - Variables

ipcY6a	ipcY7a	fpcY11a	fpcY12a	fpcY13a	ak6Y19
0.177	0.225	0.650	0.612	0.560	0.819

Squared Multiple Correlations for Y - Variables (continued)

ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35	ew24Y38
0.963	0.865	0.616	0.409	0.133	0.252

Squared Multiple Correlations for Y - Variables (continued)

pa14Y25	pa15Y26	pa16Y27
0.821	0.769	0.076

THETA-DELTA

pcr17X2	pcr19X4	pcr20X5	pcr21X6
0.515	0.321	0.039	0.075
(0.066)	(0.067)	(0.057)	(0.056)
7.849	4.765	0.686	1.344

Squared Multiple Correlations for X - Variables

pcr17X2	pcr19X4	pcr20X5	pcr21X6
0.485	0.679	0.961	0.925

ADDITIONAL PARAMETERS

PA(1)	PA(2)	PA(3)	PA(4)	PA(5)	PA(6)
-0.096	-0.079	-0.032	-0.049	-0.072	-0.103
(0.037)	(0.018)	(0.015)	(0.018)	(0.030)	(0.022)
-2.587	-4.335	-2.116	-2.748	-2.408	-4.642

Goodness of Fit Statistics

```
Degrees of Freedom = 144
Minimum Fit Function Chi-Square = 494.260 (P = 0.0)
Estimated Non-centrality Parameter (NCP) = 350.260
90 Percent Confidence Interval for NCP = (286.417 ; 421.697)

Minimum Fit Function Value = 1.206
Population Discrepancy Function Value (F0) = 0.854
90 Percent Confidence Interval for F0 = (0.699 ; 1.029)
Root Mean Square Error of Approximation (RMSEA) = 0.0770
90 Percent Confidence Interval for RMSEA = (0.0697 ; 0.0845)
P-Value for Test of Close Fit (RMSEA < 0.05) = 0.000

Expected Cross-Validation Index (ECVI) = 1.459
90 Percent Confidence Interval for ECVI = (1.289 ; 1.619)
ECVI for Saturated Model = 0.927
ECVI for Independence Model = 22.251

Chi-Square for Independence Model with 171 Degrees of Freedom = 9085.002
Independence AIC = 9123.002
Model AIC = 598.260
Saturated AIC = 380.000
Independence CAIC = 9218.355
Model CAIC = 859.227
Saturated CAIC = 1333.533

Normed Fit Index (NFI) = 0.946
Non-Normed Fit Index (NNFI) = 0.953
Parsimony Normed Fit Index (PNFI) = 0.796
Comparative Fit Index (CFI) = 0.961
Incremental Fit Index (IFI) = 0.961
Relative Fit Index (RFI) = 0.935

Critical N (CN) = 155.617


Root Mean Square Residual (RMR) = 0.140
Standardized RMR = 0.140
Goodness of Fit Index (GFI) = 0.971
Adjusted Goodness of Fit Index (AGFI) = 0.961
Parsimony Goodness of Fit Index (PGFI) = 0.736
```

Fitted Covariance Matrix

	ipcY6a	ipcY7a	fpcY11a	fpcY12a	fpcY13a	ak6Y19
ipcY6a	1.000					
ipcY7a	0.200	1.000				
fpcY11a	0.008	0.009	1.000			
fpcY12a	0.008	0.009	0.631	1.000		
fpcY13a	0.008	0.009	0.603	0.586	1.000	
ak6Y19	0.339	0.382	0.274	0.266	0.254	1.000
ak7Y20	0.368	0.414	0.297	0.288	0.276	0.888
ak9Y22	0.348	0.392	0.282	0.273	0.261	0.842
ak10Y23	0.294	0.331	0.238	0.231	0.220	0.710
ew11Y34	0.082	0.092	0.118	0.114	0.109	0.202
ew12Y35	0.047	0.053	0.067	0.065	0.062	0.115
ew24Y38	0.064	0.072	0.092	0.090	0.086	0.158
pa14Y25	0.256	0.288	0.349	0.338	0.323	0.622
pa15Y26	0.247	0.279	0.337	0.327	0.313	0.602
pa16Y27	0.078	0.087	0.106	0.103	0.098	0.189
pcr17X2	-0.032	-0.036	-0.126	-0.122	-0.117	-0.110
pcr19X4	-0.038	-0.043	-0.149	-0.144	-0.138	-0.131
pcr20X5	-0.045	-0.051	-0.177	-0.172	-0.164	-0.155
pcr21X6	-0.044	-0.050	-0.174	-0.168	-0.161	-0.152

Fitted Covariance Matrix (continued)

	ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35	ew24Y38
ak7Y20	1.000					
ak9Y22	0.912	1.000				
ak10Y23	0.770	0.730	1.000			
ew11Y34	0.219	0.207	0.175	1.000		
ew12Y35	0.125	0.118	0.100	0.234	1.000	
ew24Y38	0.172	0.163	0.137	0.321	0.183	1.000
pa14Y25	0.675	0.640	0.540	0.177	0.101	0.139
pa15Y26	0.653	0.619	0.522	0.171	0.098	0.134
pa16Y27	0.205	0.194	0.164	0.054	0.031	0.042
pcr17X2	-0.120	-0.113	-0.096	-0.037	-0.021	-0.029
pcr19X4	-0.142	-0.134	-0.113	-0.043	-0.025	-0.034
pcr20X5	-0.168	-0.160	-0.135	-0.051	-0.029	-0.040
pcr21X6	-0.165	-0.157	-0.132	-0.050	-0.029	-0.040

Fitted Covariance Matrix (continued)

	pa14Y25	pa15Y26	pa16Y27	pcr17X2	pcr19X4	pcr20X5
pa14Y25	1.000					
pa15Y26	0.795	1.000				
pa16Y27	0.249	0.241	1.000			
pcr17X2	-0.110	-0.107	-0.034	1.000		
pcr19X4	-0.131	-0.126	-0.040	0.574	1.000	
pcr20X5	-0.155	-0.150	-0.047	0.683	0.808	1.000
pcr21X6	-0.152	-0.148	-0.046	0.670	0.792	0.943

Fitted Covariance Matrix (continued)

	pcr21X6
pcr21X6	1.000

Fitted Residuals

	ipcY6a	ipcY7a	fpcY11a	fpcY12a	fpcY13a	ak6Y19
ipcY6a	0.000					
ipcY7a	0.123	0.000				
fpcY11a	0.165	0.348	0.000			
fpcY12a	0.141	0.337	0.041	0.000		
fpcY13a	0.123	0.383	0.071	0.003	0.000	
ak6Y19	-0.285	-0.091	-0.107	0.058	0.049	0.000
ak7Y20	-0.423	-0.303	-0.221	-0.155	-0.239	-0.132
ak9Y22	-0.179	-0.121	-0.192	-0.045	-0.089	-0.176
ak10Y23	-0.164	-0.079	-0.182	-0.065	-0.096	-0.189
ew11Y34	-0.016	-0.090	-0.117	-0.145	-0.106	-0.040
ew12Y35	0.156	0.009	-0.100	-0.076	-0.030	0.049
ew24Y38	0.091	-0.051	-0.053	0.040	0.002	-0.054
pa14Y25	-0.080	-0.187	-0.287	-0.222	-0.261	-0.260
pa15Y26	-0.020	-0.100	-0.259	-0.210	-0.152	-0.176
pa16Y27	0.195	0.116	-0.035	-0.045	0.049	-0.030
pcr17X2	0.114	0.020	0.089	0.072	0.143	-0.041
pcr19X4	0.144	0.090	0.143	0.101	0.180	-0.143
pcr20X5	0.172	0.140	0.083	0.121	0.138	0.029
pcr21X6	0.143	0.153	0.133	0.172	0.235	0.017

Fitted Residuals (continued)

	ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35	ew24Y38
ak7Y20	0.000					
ak9Y22	-0.486	0.000				
ak10Y23	-0.329	-0.252	0.000			
ew11Y34	0.024	-0.027	0.017	0.000		
ew12Y35	-0.070	-0.050	0.108	0.070	0.000	
ew24Y38	-0.161	0.153	-0.042	-0.053	0.048	0.000
pa14Y25	-0.455	-0.086	-0.053	-0.021	0.171	0.107
pa15Y26	-0.286	-0.014	0.026	0.009	0.148	0.108
pa16Y27	-0.289	0.074	0.038	0.123	0.132	0.194
pcr17X2	0.080	-0.066	-0.007	0.103	0.078	0.062
pcr19X4	0.136	-0.001	0.067	0.114	0.182	0.011
pcr20X5	0.151	0.003	0.029	0.141	0.067	-0.079
pcr21X6	0.221	0.074	0.004	0.122	0.103	0.015

Fitted Residuals (continued)

	pa14Y25	pa15Y26	pa16Y27	pcr17X2	pcr19X4	pcr20X5
pa14Y25	0.000					
pa15Y26	-0.095	0.000				
pa16Y27	0.143	0.104	0.000			
pcr17X2	0.020	-0.007	0.009	0.000		
pcr19X4	0.020	0.165	0.002	0.063	0.000	
pcr20X5	0.124	0.094	0.158	-0.036	-0.080	0.000
pcr21X6	0.123	0.166	0.100	-0.001	-0.034	-0.023

Fitted Residuals (continued)

	pcr21X6
pcr21X6	0.000

Summary Statistics for Fitted Residuals

```
Smallest Fitted Residual =  -0.486
  Median Fitted Residual =   0.000
 Largest Fitted Residual =   0.383
```

Stemleaf Plot

```
- 4|96
- 4|2
- 3|
- 3|30
- 2|99986665
- 2|4221
- 1|99988886665
- 1|44322110000
- 0|999988888776555555
- 0|44444443333222211100000000000000000000000000
  0|11112222222333444
  0|555566677777778889999
  1|000001111122222222334444444444
  1|5555666777778899
  2|23
  2|
  3|4
  3|58
```

12

Standardized Residuals

	ipcY6a	ipcY7a	fpcY11a	fpcY12a	fpcY13a	ak6Y19
ipcY6a	- -					
ipcY7a	2.542	- -				
fpcY11a	2.925	6.459	- -			
fpcY12a	2.521	6.622	1.625	- -		
fpcY13a	2.080	8.122	2.845	0.101	- -	
ak6Y19	-3.637	-1.244	-1.222	0.756	0.686	- -
ak7Y20	-4.358	-3.050	-1.895	-1.374	-2.689	-2.249
ak9Y22	-2.835	-2.057	-2.801	-0.679	-1.309	-3.010
ak10Y23	-2.460	-1.304	-3.001	-0.998	-1.480	-2.670
ew11Y34	-0.227	-1.227	-1.882	-2.176	-1.619	-0.412
ew12Y35	2.383	0.143	-1.592	-1.188	-0.463	0.523
ew24Y38	1.424	-0.830	-0.924	0.696	0.029	-0.595
pa14Y25	-1.347	-3.177	-5.154	-3.769	-4.488	-3.142
pa15Y26	-0.308	-1.558	-4.069	-3.380	-2.346	-2.148
pa16Y27	2.882	1.909	-0.548	-0.681	0.755	-0.307
pcr17X2	1.938	0.370	1.593	1.421	2.806	-0.505
pcr19X4	1.994	1.339	2.181	1.564	2.813	-1.438
pcr20X5	2.597	2.270	1.483	2.116	2.459	0.289
pcr21X6	2.282	2.521	2.379	3.279	4.242	0.198

Standardized Residuals (continued)

	ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35	ew24Y38
ak7Y20	- -					
ak9Y22	-5.122	- -				
ak10Y23	-3.584	-3.894	- -			
ew11Y34	0.217	-0.325	0.208	- -		
ew12Y35	-0.610	-0.598	1.329	1.140	- -	
ew24Y38	-1.483	2.099	-0.531	-0.945	0.780	- -
pa14Y25	-4.298	-1.535	-0.846	-0.260	2.297	1.519
pa15Y26	-2.815	-0.256	0.435	0.103	1.835	1.395
pa16Y27	-2.550	0.907	0.457	1.374	1.625	2.516
pcr17X2	0.733	-0.966	-0.100	1.320	1.100	0.895
pcr19X4	1.061	-0.008	0.727	1.246	2.190	0.130
pcr20X5	1.267	0.029	0.326	1.562	0.806	-0.994
pcr21X6	1.970	0.968	0.054	1.411	1.308	0.194

Standardized Residuals (continued)

	pa14Y25	pa15Y26	pa16Y27	pcr17X2	pcr19X4	pcr20X5
pa14Y25	- -					
pa15Y26	-2.610	- -				
pa16Y27	2.297	1.435	- -			
pcr17X2	0.295	-0.094	0.132	- -		
pcr19X4	0.237	1.787	0.018	1.578	- -	
pcr20X5	1.570	1.111	1.880	-0.800	-2.269	- -
pcr21X6	1.638	2.084	1.248	-0.021	-0.906	-1.642

Standardized Residuals (continued)

	pcr21X6
pcr21X6	- -

Summary Statistics for Standardized Residuals

```
Smallest Standardized Residual =   -5.154
  Median Standardized Residual =    0.000
 Largest Standardized Residual =    8.122
```

Stemleaf Plot

```
- 5|21
- 4|5431
- 3|9866421100
- 2|88877665332211
- 1|99666655544333222000
- 0|99988877666555543333211000000000000000000000000
  0|111111222223334455777788889 9
  1|0111122333334444445566666666688999
  2|001111223333445555568889 9
  3|3
  4|2
  5|
  6|56
  7|
  8|1
```

Largest Negative Standardized Residuals

Residual for	ak6Y19	and	ipcY6a	-3.637
Residual for	ak7Y20	and	ipcY6a	-4.358
Residual for	ak7Y20	and	ipcY7a	-3.050
Residual for	ak7Y20	and	fpcY13a	-2.689
Residual for	ak9Y22	and	ipcY6a	-2.835
Residual for	ak9Y22	and	fpcY11a	-2.801
Residual for	ak9Y22	and	ak6Y19	-3.010
Residual for	ak9Y22	and	ak7Y20	-5.122
Residual for	ak10Y23	and	fpcY11a	-3.001
Residual for	ak10Y23	and	ak6Y19	-2.670
Residual for	ak10Y23	and	ak7Y20	-3.584
Residual for	ak10Y23	and	ak9Y22	-3.894
Residual for	pa14Y25	and	ipcY7a	-3.177
Residual for	pa14Y25	and	fpcY11a	-5.154
Residual for	pa14Y25	and	fpcY12a	-3.769
Residual for	pa14Y25	and	fpcY13a	-4.488
Residual for	pa14Y25	and	ak6Y19	-3.142
Residual for	pa14Y25	and	ak7Y20	-4.298
Residual for	pa15Y26	and	fpcY11a	-4.069
Residual for	pa15Y26	and	fpcY12a	-3.380
Residual for	pa15Y26	and	ak7Y20	-2.815
Residual for	pa15Y26	and	pa14Y25	-2.610

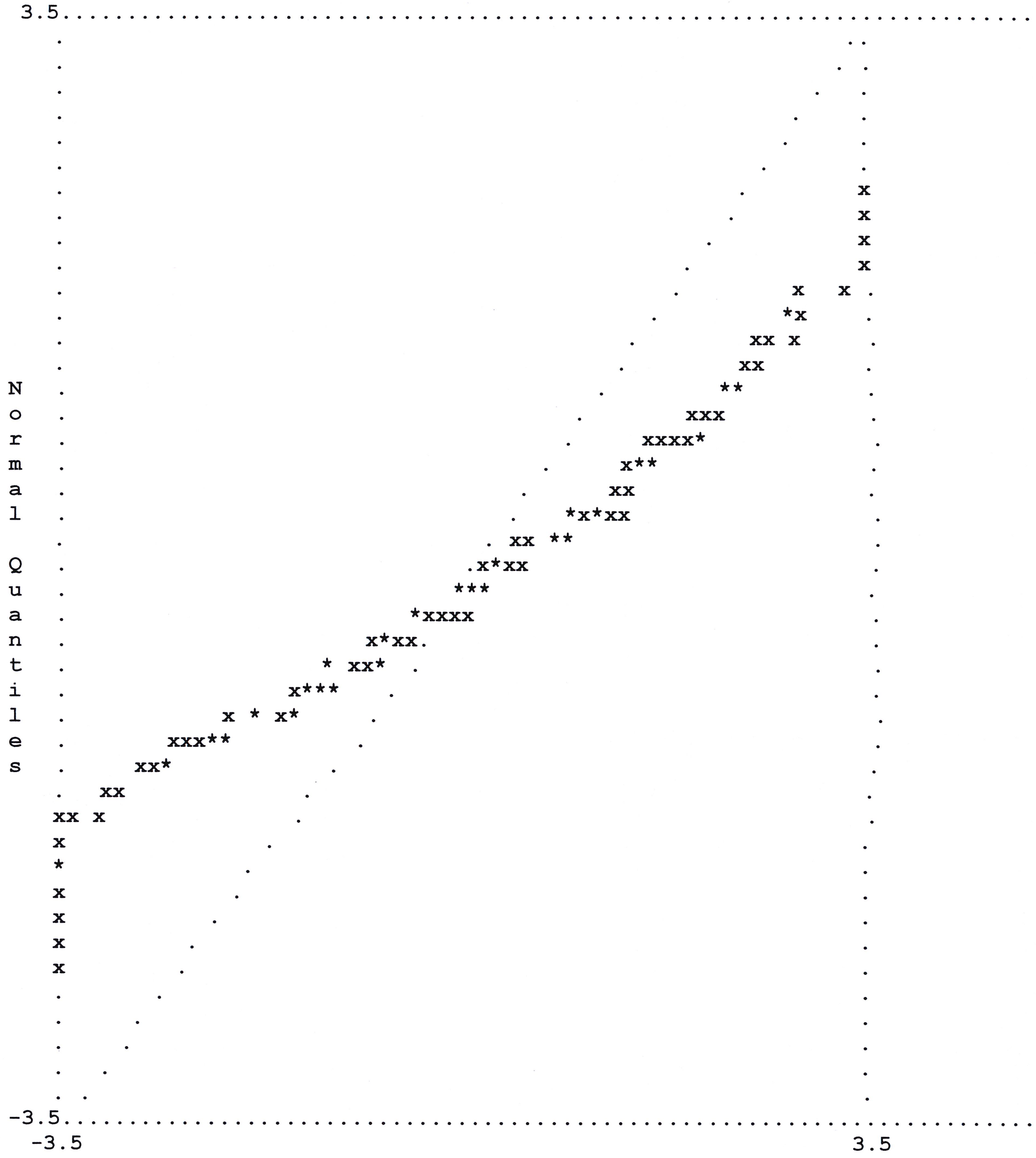
Largest Positive Standardized Residuals

Residual for	fpcY11a	and	ipcY6a	2.925
Residual for	fpcY11a	and	ipcY7a	6.459
Residual for	fpcY12a	and	ipcY7a	6.622
Residual for	fpcY13a	and	ipcY7a	8.122
Residual for	fpcY13a	and	fpcY11a	2.845

Residual for	pa16Y27	and	ipcY6a	2.882
Residual for	pcr17X2	and	fpcY13a	2.806
Residual for	pcr19X4	and	fpcY13a	2.813
Residual for	pcr20X5	and	ipcY6a	2.597
Residual for	pcr21X6	and	fpcY12a	3.279
Residual for	pcr21X6	and	fpcY13a	4.242

!PCLI Model: LISREL Run 2

Qplot of Standardized Residuals



Modification Indices and Expected Change

Modification Indices for LAMBDA-Y

	IPCLI	FPCLI	AK	EW	PA
ipcY6a	- -	0.285	2.173	22.982	0.115
ipcY7a	- -	99.200	109.697	2.194	34.171
fpcY11a	7.512	- -	10.474	8.820	1.226
fpcY12a	24.795	- -	24.818	6.002	17.145
fpcY13a	9.140	- -	9.812	13.945	1.449
ak6Y19	20.873	20.174	- -	2.421	0.133
ak7Y20	0.140	2.913	- -	3.401	15.774
ak9Y22	0.541	0.022	- -	1.308	20.196
ak10Y23	13.441	11.603	- -	0.013	0.104
ew11Y34	0.244	1.620	0.023	- -	2.001
ew12Y35	1.943	4.640	0.004	- -	1.163
ew24Y38	2.367	10.881	0.073	- -	0.782
pa14Y25	1.206	1.714	0.057	0.485	- -
pa15Y26	0.349	0.083	1.514	0.470	- -
pa16Y27	2.970	12.510	0.417	3.894	- -

Expected Change for LAMBDA-Y

	IPCLI	FPCLI	AK	EW	PA
ipcY6a	- -	-0.022	-0.167	0.383	0.022
ipcY7a	- -	0.383	1.158	0.114	0.399
fpcY11a	-0.088	- -	-0.111	-0.138	-0.044
fpcY12a	0.163	- -	0.174	0.124	0.175
fpcY13a	0.095	- -	0.104	0.189	0.046
ak6Y19	-0.608	0.231	- -	0.121	0.036
ak7Y20	0.062	-0.107	- -	-0.209	-0.442
ak9Y22	0.090	0.007	- -	-0.090	0.442
ak10Y23	0.453	-0.165	- -	-0.009	0.037
ew11Y34	0.046	-0.093	0.017	- -	-0.144
ew12Y35	0.090	-0.119	-0.004	- -	0.072
ew24Y38	-0.105	0.215	-0.021	- -	0.071
pa14Y25	-0.088	0.077	-0.040	-0.058	- -
pa15Y26	0.049	-0.017	0.221	0.052	- -
pa16Y27	0.133	-0.216	-0.075	0.175	- -

Standardized Expected Change for LAMBDA-Y

	IPCLI	FPCLI	AK	EW	PA
ipcY6a	- -	-0.022	-0.167	0.383	0.022
ipcY7a	- -	0.383	1.158	0.114	0.399
fpcY11a	-0.088	- -	-0.111	-0.138	-0.044
fpcY12a	0.163	- -	0.174	0.124	0.175
fpcY13a	0.095	- -	0.104	0.189	0.046
ak6Y19	-0.608	0.231	- -	0.121	0.036
ak7Y20	0.062	-0.107	- -	-0.209	-0.442
ak9Y22	0.090	0.007	- -	-0.090	0.442
ak10Y23	0.453	-0.165	- -	-0.009	0.037
ew11Y34	0.046	-0.093	0.017	- -	-0.144
ew12Y35	0.090	-0.119	-0.004	- -	0.072
ew24Y38	-0.105	0.215	-0.021	- -	0.071
pa14Y25	-0.088	0.077	-0.040	-0.058	- -
pa15Y26	0.049	-0.017	0.221	0.052	- -
pa16Y27	0.133	-0.216	-0.075	0.175	- -

Completely Standardized Expected Change for LAMBDA-Y

	IPCLI	FPCLI	AK	EW	PA
ipcY6a	- -	-0.022	-0.167	0.383	0.022
ipcY7a	- -	0.383	1.158	0.114	0.399
fpcY11a	-0.088	- -	-0.111	-0.138	-0.044
fpcY12a	0.163	- -	0.174	0.124	0.175
fpcY13a	0.095	- -	0.104	0.189	0.046
ak6Y19	-0.608	0.231	- -	0.121	0.036
ak7Y20	0.062	-0.107	- -	-0.209	-0.442
ak9Y22	0.090	0.007	- -	-0.090	0.442
ak10Y23	0.453	-0.165	- -	-0.009	0.037
ew11Y34	0.046	-0.093	0.017	- -	-0.144
ew12Y35	0.090	-0.119	-0.004	- -	0.072
ew24Y38	-0.105	0.215	-0.021	- -	0.071
pa14Y25	-0.088	0.077	-0.040	-0.058	- -
pa15Y26	0.049	-0.017	0.221	0.052	- -
pa16Y27	0.133	-0.216	-0.075	0.175	- -

No Non-Zero Modification Indices for LAMBDA-X

Modification Indices for BETA

	IPCLI	FPCLI	AK	EW	PA
IPCLI	- -	77.681	75.799	76.114	77.948
FPCLI	77.681	- -	76.135	69.044	77.434
AK	- -	- -	- -	1.292	26.590
EW	- -	- -	1.292	- -	0.274
PA	- -	- -	26.589	0.274	- -

Expected Change for BETA

	IPCLI	FPCLI	AK	EW	PA
IPCLI	- -	0.662	1.839	2.749	1.417
FPCLI	0.636	- -	0.713	1.719	0.941
AK	- -	- -	- -	-0.104	2.055
EW	- -	- -	-1.066	- -	0.108
PA	- -	- -	8.334	0.043	- -

Standardized Expected Change for BETA

	IPCLI	FPCLI	AK	EW	PA
IPCLI	- -	0.662	1.839	2.749	1.417
FPCLI	0.636	- -	0.713	1.719	0.941
AK	- -	- -	- -	-0.104	2.055
EW	- -	- -	-1.066	- -	0.108
PA	- -	- -	8.334	0.043	- -

Modification Indices for GAMMA

	PCRQ
IPCLI	- -
FPCLI	- -
AK	4.027
EW	2.353
PA	1.595

Expected Change for GAMMA

	PCRQ
IPCLI	- -
FPCLI	- -
AK	-0.117
EW	0.127
PA	0.066

Standardized Expected Change for GAMMA

	PCRQ
IPCLI	- -
FPCLI	- -
AK	-0.117
EW	0.127
PA	0.066

No Non-Zero Modification Indices for PHI

Modification Indices for PSI

	IPCLI	FPCLI	AK	EW	PA
IPCLI	- -				
FPCLI	77.681	- -			
AK	4.027	4.027	- -		
EW	2.353	2.353	1.292	- -	
PA	1.595	1.595	26.590	0.274	- -

Expected Change for PSI

	IPCLI	FPCLI	AK	EW	PA
IPCLI	- -				
FPCLI	0.629	- -			
AK	-1.058	-0.495	- -		
EW	1.153	0.539	-0.089	- -	
PA	0.597	0.279	0.697	0.037	- -

Standardized Expected Change for PSI

	IPCLI	FPCLI	AK	EW	PA
IPCLI	- -				
FPCLI	0.629	- -			
AK	-1.058	-0.495	- -		
EW	1.153	0.539	-0.089	- -	
PA	0.597	0.279	0.697	0.037	- -

Modification Indices for THETA-EPS

	ipcY6a	ipcY7a	fpcY11a	fpcY12a	fpcY13a	ak6Y19
ipcY6a	- -					
ipcY7a	30.324	- -				
fpcY11a	0.226	14.193	- -			
fpcY12a	3.688	4.049	0.676	- -		
fpcY13a	7.919	23.803	6.188	5.843	- -	
ak6Y19	0.015	1.263	2.704	6.765	15.737	- -
ak7Y20	1.597	0.708	0.254	0.419	3.290	7.612
ak9Y22	3.755	1.853	2.054	0.594	0.079	4.930
ak10Y23	4.918	6.625	29.410	0.000	8.780	0.372
ew11Y34	1.130	1.013	0.085	1.514	0.495	3.787
ew12Y35	3.559	7.212	1.209	4.248	1.796	0.382
ew24Y38	19.603	21.100	6.262	9.955	3.840	2.446
pa14Y25	2.707	20.227	9.098	1.799	15.619	0.115
pa15Y26	0.083	0.802	0.865	0.166	0.896	2.561
pa16Y27	0.884	8.829	0.768	14.087	0.064	0.298

Modification Indices for THETA-EPS (continued)

	ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35	ew24Y38
ak7Y20	- -					
ak9Y22	2.241	- -				
ak10Y23	6.196	12.261	- -			
ew11Y34	0.138	1.590	4.111	- -		
ew12Y35	1.669	11.359	0.000	1.026	- -	
ew24Y38	0.021	3.770	3.716	0.168	0.507	- -
pa14Y25	21.634	23.319	4.630	8.129	8.978	0.145
pa15Y26	2.707	2.263	0.013	0.842	0.048	0.105
pa16Y27	13.943	0.299	0.310	3.343	0.748	1.797

Modification Indices for THETA-EPS (continued)

	pa14Y25	pa15Y26	pa16Y27
pa14Y25	- -		
pa15Y26	5.884	- -	
pa16Y27	2.501	0.749	- -

Expected Change for THETA-EPS

	ipcY6a	ipcY7a	fpcY11a	fpcY12a	fpcY13a	ak6Y19
ipcY6a	- -					
ipcY7a	0.292	- -				
fpcY11a	0.013	0.099	- -			
fpcY12a	0.055	0.053	0.047	- -		
fpcY13a	-0.090	0.132	0.138	-0.110	- -	
ak6Y19	0.005	-0.044	-0.051	0.086	0.155	- -
ak7Y20	-0.059	-0.041	0.018	0.025	-0.074	0.232
ak9Y22	-0.086	0.056	-0.040	0.025	-0.009	-0.093
ak10Y23	-0.109	0.106	-0.150	-0.001	0.098	0.031
ew11Y34	0.054	-0.052	0.011	-0.049	0.027	0.108
ew12Y35	0.093	0.114	-0.036	-0.077	0.049	0.032
ew24Y38	0.214	-0.193	-0.084	0.114	0.071	-0.087
pa14Y25	0.072	-0.189	0.082	0.049	-0.119	-0.012
pa15Y26	-0.012	-0.035	-0.029	-0.013	0.030	-0.062
pa16Y27	0.048	0.135	0.028	-0.136	-0.010	0.025

Expected Change for THETA-EPS (continued)

	ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35	ew24Y38
ak7Y20	- -					
ak9Y22	0.075	- -				
ak10Y23	0.141	-0.165	- -			
ew11Y34	-0.026	-0.072	0.116	- -		
ew12Y35	-0.075	-0.172	-0.001	0.092	- -	
ew24Y38	-0.009	0.102	-0.114	-0.057	-0.056	- -
pa14Y25	-0.232	0.224	0.102	-0.147	0.157	0.020
pa15Y26	0.079	0.073	0.005	0.049	0.011	-0.017
pa16Y27	-0.211	-0.027	0.029	0.127	0.055	0.080

Expected Change for THETA-EPS (continued)

	pa14Y25	pa15Y26	pa16Y27
pa14Y25	- -		
pa15Y26	-0.478	- -	
pa16Y27	0.099	0.052	- -

Completely Standardized Expected Change for THETA-EPS

	ipcY6a	ipcY7a	fpcY11a	fpcY12a	fpcY13a	ak6Y19
ipcY6a	- -					
ipcY7a	0.292	- -				
fpcY11a	0.013	0.099	- -			
fpcY12a	0.055	0.053	0.047	- -		
fpcY13a	-0.090	0.132	0.138	-0.110	- -	
ak6Y19	0.005	-0.044	-0.051	0.086	0.155	- -
ak7Y20	-0.059	-0.041	0.018	0.025	-0.074	0.232
ak9Y22	-0.086	0.056	-0.040	0.025	-0.009	-0.093
ak10Y23	-0.109	0.106	-0.150	-0.001	0.098	0.031
ew11Y34	0.054	-0.052	0.011	-0.049	0.027	0.108
ew12Y35	0.093	0.114	-0.036	-0.077	0.049	0.032
ew24Y38	0.214	-0.193	-0.084	0.114	0.071	-0.087
pa14Y25	0.072	-0.189	0.082	0.049	-0.119	-0.012
pa15Y26	-0.012	-0.035	-0.029	-0.013	0.030	-0.062
pa16Y27	0.048	0.135	0.028	-0.136	-0.010	0.025

Completely Standardized Expected Change for THETA-EPS (continued)

	ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35	ew24Y38
ak7Y20	- -					
ak9Y22	0.075	- -				
ak10Y23	0.141	-0.165	- -			
ew11Y34	-0.026	-0.072	0.116	- -		
ew12Y35	-0.075	-0.172	-0.001	0.092	- -	
ew24Y38	-0.009	0.102	-0.114	-0.057	-0.056	- -
pa14Y25	-0.232	0.224	0.102	-0.147	0.157	0.020
pa15Y26	0.079	0.073	0.005	0.049	0.011	-0.017
pa16Y27	-0.211	-0.027	0.029	0.127	0.055	0.080

Completely Standardized Expected Change for THETA-EPS (continued)

	pa14Y25	pa15Y26	pa16Y27
pa14Y25	- -		
pa15Y26	-0.478	- -	
pa16Y27	0.099	0.052	- -

Modification Indices for THETA-DELTA-EPS

	ipcY6a	ipcY7a	fpcY11a	fpcY12a	fpcY13a	ak6Y19
pcr17X2	17.858	9.775	0.030	0.269	1.700	0.527
pcr19X4	2.085	0.343	5.246	2.639	16.510	0.684
pcr20X5	1.026	11.627	2.440	0.077	0.046	1.150
pcr21X6	0.703	2.027	0.814	0.546	6.347	0.149

Modification Indices for THETA-DELTA-EPS (continued)

	ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35	ew24Y38
pcr17X2	0.264	1.540	4.874	2.070	0.461	2.474
pcr19X4	16.622	0.250	0.365	0.725	0.489	0.135
pcr20X5	4.310	0.332	2.354	0.562	13.877	8.063
pcr21X6	7.516	1.769	0.434	1.303	5.586	0.303

Modification Indices for THETA-DELTA-EPS (continued)

	pa14Y25	pa15Y26	pa16Y27
pcr17X2	9.506	5.582	2.202
pcr19X4	0.878	1.196	2.378
pcr20X5	8.881	2.078	5.301
pcr21X6	8.322	2.712	0.329

Expected Change for THETA-DELTA-EPS

	ipcY6a	ipcY7a	fpcY11a	fpcY12a	fpcY13a	ak6Y19
pcr17X2	0.157	-0.106	-0.004	-0.013	0.034	0.030
pcr19X4	-0.057	0.019	0.066	0.045	-0.109	-0.031
pcr20X5	-0.027	0.079	-0.033	-0.006	-0.004	-0.033
pcr21X6	0.020	-0.034	-0.017	0.015	0.052	-0.010

Expected Change for THETA-DELTA-EPS (continued)

	ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35	ew24Y38
pcr17X2	0.028	-0.050	0.092	0.068	0.029	0.062
pcr19X4	-0.174	0.021	0.028	-0.039	0.032	0.017
pcr20X5	0.080	0.023	-0.052	0.029	-0.136	-0.097
pcr21X6	0.084	-0.038	-0.020	0.037	0.076	0.018

Expected Change for THETA-DELTA-EPS (continued)

	pa14Y25	pa15Y26	pa16Y27
pcr17X2	0.125	-0.101	-0.066
pcr19X4	-0.035	0.034	-0.075
pcr20X5	0.096	-0.049	0.089
pcr21X6	-0.079	0.043	-0.020

Completely Standardized Expected Change for THETA-DELTA-EPS

	ipcY6a	ipcY7a	fpcY11a	fpcY12a	fpcY13a	ak6Y19
pcr17X2	0.157	-0.106	-0.004	-0.013	0.034	0.030
pcr19X4	-0.057	0.019	0.066	0.045	-0.109	-0.031
pcr20X5	-0.027	0.079	-0.033	-0.006	-0.004	-0.033
pcr21X6	0.020	-0.034	-0.017	0.015	0.052	-0.010

Completely Standardized Expected Change for THETA-DELTA-EPS (continued)

	ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35	ew24Y38
pcr17X2	0.028	-0.050	0.092	0.068	0.029	0.062
pcr19X4	-0.174	0.021	0.028	-0.039	0.032	0.017
pcr20X5	0.080	0.023	-0.052	0.029	-0.136	-0.097
pcr21X6	0.084	-0.038	-0.020	0.037	0.076	0.018

Completely Standardized Expected Change for THETA-DELTA-EPS (continued)

	pa14Y25	pa15Y26	pa16Y27
pcr17X2	0.125	-0.101	-0.066
pcr19X4	-0.035	0.034	-0.075
pcr20X5	0.096	-0.049	0.089
pcr21X6	-0.079	0.043	-0.020

Modification Indices for THETA-DELTA

	pcr17X2	pcr19X4	pcr20X5	pcr21X6
pcr17X2	- -			
pcr19X4	3.305	- -		
pcr20X5	0.525	1.279	- -	
pcr21X6	0.011	0.753	4.467	- -

Expected Change for THETA-DELTA

	pcr17X2	pcr19X4	pcr20X5	pcr21X6
pcr17X2	- -			
pcr19X4	0.058	- -		
pcr20X5	-0.019	-0.039	- -	
pcr21X6	-0.003	-0.028	0.108	- -

Completely Standardized Expected Change for THETA-DELTA

	pcr17X2	pcr19X4	pcr20X5	pcr21X6
pcr17X2	- -			
pcr19X4	0.058	- -		
pcr20X5	-0.019	-0.039	- -	
pcr21X6	-0.003	-0.028	0.108	- -

Maximum Modification Index is 109.70 for Element (2, 3) of LAMBDA-Y

Standardized Solution

LAMBDA-Y

	IPCLI	FPCLI	AK	EW	PA
ipcY6a	0.421	- -	- -	- -	- -
ipcY7a	0.475	- -	- -	- -	- -
fpcY11a	- -	0.806	- -	- -	- -
fpcY12a	- -	0.783	- -	- -	- -
fpcY13a	- -	0.748	- -	- -	- -
ak6Y19	- -	- -	0.905	- -	- -
ak7Y20	- -	- -	0.981	- -	- -
ak9Y22	- -	- -	0.930	- -	- -
ak10Y23	- -	- -	0.785	- -	- -
ew11Y34	- -	- -	- -	0.640	- -
ew12Y35	- -	- -	- -	0.365	- -
ew24Y38	- -	- -	- -	0.502	- -
pa14Y25	- -	- -	- -	- -	0.906
pa15Y26	- -	- -	- -	- -	0.877
pa16Y27	- -	- -	- -	- -	0.275

LAMBDA-X

	PCRQ
pcr17X2	0.696
pcr19X4	0.824
pcr20X5	0.980
pcr21X6	0.962

BETA

	IPCLI	FPCLI	AK	EW	PA
IPCLI	- -	- -	- -	- -	- -
FPCLI	- -	- -	- -	- -	- -
AK	0.881	0.354	- -	- -	- -
EW	0.298	0.221	- -	- -	- -
PA	0.659	0.461	- -	- -	- -

GAMMA

	PCRQ
IPCLI	-0.109
FPCLI	-0.224
AK	- -
EW	- -
PA	- -

Correlation Matrix of ETA and KSI

	IPCLI	FPCLI	AK	EW	PA	PCRQ
IPCLI	1.000					
FPCLI	0.024	1.000				
AK	0.889	0.375	1.000			
EW	0.304	0.228	0.348	1.000		
PA	0.670	0.477	0.759	0.305	1.000	
PCRQ	-0.109	-0.224	-0.175	-0.082	-0.175	1.000

PSI

Note: This matrix is diagonal.

IPCLI	FPCLI	AK	EW	PA
0.988	0.950	0.084	0.859	0.339

Regression Matrix ETA on KSI (Standardized)

	PCRQ
IPCLI	-0.109
FPCLI	-0.224
AK	-0.175
EW	-0.082
PA	-0.175

!PCLI Model: LISREL Run 2

Completely Standardized Solution

LAMBDA-Y

	IPCLI	FPCLI	AK	EW	PA
ipcY6a	0.421	- -	- -	- -	- -
ipcY7a	0.475	- -	- -	- -	- -
fpcY11a	- -	0.806	- -	- -	- -
fpcY12a	- -	0.783	- -	- -	- -
fpcY13a	- -	0.748	- -	- -	- -
ak6Y19	- -	- -	0.905	- -	- -
ak7Y20	- -	- -	0.981	- -	- -
ak9Y22	- -	- -	0.930	- -	- -
ak10Y23	- -	- -	0.785	- -	- -
ew11Y34	- -	- -	- -	0.640	- -
ew12Y35	- -	- -	- -	0.365	- -
ew24Y38	- -	- -	- -	0.502	- -
pa14Y25	- -	- -	- -	- -	0.906
pa15Y26	- -	- -	- -	- -	0.877
pa16Y27	- -	- -	- -	- -	0.275

LAMBDA-X

	PCRQ
pcr17X2	0.696
pcr19X4	0.824
pcr20X5	0.980
pcr21X6	0.962

BETA

	IPCLI	FPCLI	AK	EW	PA
IPCLI	- -	- -	- -	- -	- -
FPCLI	- -	- -	- -	- -	- -
AK	0.881	0.354	- -	- -	- -
EW	0.298	0.221	- -	- -	- -
PA	0.659	0.461	- -	- -	- -

GAMMA

	PCRQ
IPCLI	-0.109
FPCLI	-0.224
AK	- -
EW	- -
PA	- -

Correlation Matrix of ETA and KSI

	IPCLI	FPCLI	AK	EW	PA	PCRQ
IPCLI	1.000					
FPCLI	0.024	1.000				
AK	0.889	0.375	1.000			
EW	0.304	0.228	0.348	1.000		
PA	0.670	0.477	0.759	0.305	1.000	
PCRQ	-0.109	-0.224	-0.175	-0.082	-0.175	1.000

PSI

Note: This matrix is diagonal.

IPCLI	FPCLI	AK	EW	PA
0.988	0.950	0.084	0.859	0.339

THETA-EPS

ipcY6a	ipcY7a	fpcY11a	fpcY12a	fpcY13a	ak6Y19
0.823	0.775	0.350	0.388	0.440	0.181

THETA-EPS (continued)

ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35	ew24Y38
0.037	0.135	0.384	0.591	0.867	0.748

THETA-EPS (continued)

pa14Y25	pa15Y26	pa16Y27
0.179	0.231	0.924

THETA-DELTA

pcr17X2	pcr19X4	pcr20X5	pcr21X6
0.515	0.321	0.039	0.075

Regression Matrix ETA on KSI (Standardized)

	PCRQ
IPCLI	-0.109
FPCLI	-0.224
AK	-0.175
EW	-0.082
PA	-0.175

Total and Indirect Effects

Total Effects of KSI on ETA

	PCRQ
IPCLI	-0.109
	(0.043)
	-2.554
FPCLI	-0.224
	(0.042)
	-5.294
AK	-0.175
	(0.037)
	-4.781
EW	-0.082
	(0.023)
	-3.529
PA	-0.175
	(0.033)
	-5.243

Indirect Effects of KSI on ETA

	PCRQ
IPCLI	- -
FPCLI	- -
AK	-0.175
	(0.037)
	-4.781
EW	-0.082
	(0.023)
	-3.529
PA	-0.175
	(0.033)
	-5.243

Total Effects of ETA on ETA

	IPCLI	FPCLI	AK	EW	PA
IPCLI	- -	- -	- -	- -	- -
FPCLI	- -	- -	- -	- -	- -
AK	0.881	0.354	- -	- -	- -
	(0.113)	(0.047)			
	7.821	7.525			
EW	0.298	0.221	- -	- -	- -
	(0.081)	(0.067)			
	3.698	3.314			
PA	0.659	0.461	- -	- -	- -
	(0.086)	(0.048)			
	7.640	9.666			

Largest Eigenvalue of B*B' (Stability Index) is 1.662

Total Effects of ETA on Y (continued)

	IPCLI	FPCLI	AK	EW	PA
ipcY6a	0.421	- -	- -	- -	- -
ipcY7a	0.475	- -	- -	- -	- -
	(0.054)				
	8.760				
fpcY11a	- -	0.806	- -	- -	- -
fpcY12a	- -	0.783	- -	- -	- -
		(0.035)			
		22.401			
fpcY13a	- -	0.748	- -	- -	- -
		(0.034)			
		22.214			
ak6Y19	0.797	0.320	0.905	- -	- -
	(0.102)	(0.043)			
	7.821	7.525			
ak7Y20	0.864	0.347	0.981	- -	- -
	(0.119)	(0.048)	(0.058)		
	7.257	7.173	17.008		
ak9Y22	0.819	0.329	0.930	- -	- -
	(0.107)	(0.045)	(0.042)		
	7.674	7.310	22.314		
ak10Y23	0.691	0.278	0.785	- -	- -
	(0.091)	(0.038)	(0.039)		
	7.557	7.277	19.956		
ew11Y34	0.191	0.141	- -	0.640	- -
	(0.052)	(0.043)			
	3.698	3.314			
ew12Y35	0.109	0.081	- -	0.365	- -
	(0.030)	(0.025)		(0.099)	
	3.581	3.185		3.692	
ew24Y38	0.150	0.111	- -	0.502	- -
	(0.041)	(0.036)		(0.123)	
	3.699	3.084		4.077	
pa14Y25	0.597	0.418	- -	- -	0.906
	(0.078)	(0.043)			
	7.640	9.666			
pa15Y26	0.578	0.404	- -	- -	0.877
	(0.077)	(0.042)			(0.061)
	7.477	9.635			14.421
pa16Y27	0.181	0.127	- -	- -	0.275
	(0.040)	(0.027)			(0.052)
	4.557	4.685			5.316

Indirect Effects of ETA on Y

	IPCLI	FPCLI	AK	EW	PA
ipcY6a	- -	- -	- -	- -	- -
ipcY7a	- -	- -	- -	- -	- -
fpcY11a	- -	- -	- -	- -	- -
fpcY12a	- -	- -	- -	- -	- -
fpcY13a	- -	- -	- -	- -	- -
ak6Y19	0.797	0.320	- -	- -	- -
	(0.102)	(0.043)			
	7.821	7.525			
ak7Y20	0.864	0.347	- -	- -	- -
	(0.119)	(0.048)			
	7.257	7.173			
ak9Y22	0.819	0.329	- -	- -	- -
	(0.107)	(0.045)			
	7.674	7.310			
ak10Y23	0.691	0.278	- -	- -	- -
	(0.091)	(0.038)			
	7.557	7.277			
ew11Y34	0.191	0.141	- -	- -	- -
	(0.052)	(0.043)			
	3.698	3.314			
ew12Y35	0.109	0.081	- -	- -	- -
	(0.030)	(0.025)			
	3.581	3.185			
ew24Y38	0.150	0.111	- -	- -	- -
	(0.041)	(0.036)			
	3.699	3.084			
pa14Y25	0.597	0.418	- -	- -	- -
	(0.078)	(0.043)			
	7.640	9.666			
pa15Y26	0.578	0.404	- -	- -	- -
	(0.077)	(0.042)			
	7.477	9.635			
pa16Y27	0.181	0.127	- -	- -	- -
	(0.040)	(0.027)			
	4.557	4.685			

Total Effects of KSI on Y

	PCRQ
ipcY6a	-0.046
	(0.018)
	-2.554
ipcY7a	-0.052
	(0.020)
	-2.550
fpcY11a	-0.181
	(0.034)
	-5.294
fpcY12a	-0.175
	(0.033)
	-5.315
fpcY13a	-0.167
	(0.031)
	-5.321
ak6Y19	-0.159
	(0.033)
	-4.781

ak7Y20	-0.172
	(0.036)
	-4.755
ak9Y22	-0.163
	(0.035)
	-4.686
ak10Y23	-0.137
	(0.029)
	-4.707
ew11Y34	-0.052
	(0.015)
	-3.529
ew12Y35	-0.030
	(0.009)
	-3.522
ew24Y38	-0.041
	(0.012)
	-3.294
pa14Y25	-0.159
	(0.030)
	-5.243
pa15Y26	-0.153
	(0.029)
	-5.328
pa16Y27	-0.048
	(0.012)
	-4.042

!PCLI_Model: LISREL Run 2

Standardized Total and Indirect Effects

Standardized Total Effects of KSI on ETA

	PCRQ
IPCLI	-0.109
FPCLI	-0.224
AK	-0.175
EW	-0.082
PA	-0.175

Standardized Indirect Effects of KSI on ETA

	PCRQ
IPCLI	- -
FPCLI	- -
AK	-0.175
EW	-0.082
PA	-0.175

Standardized Total Effects of ETA on ETA

	IPCLI	FPCLI	AK	EW	PA
IPCLI	- -	- -	- -	- -	- -
FPCLI	- -	- -	- -	- -	- -
AK	0.881	0.354	- -	- -	- -
EW	0.298	0.221	- -	- -	- -
PA	0.659	0.461	- -	- -	- -

Standardized Total Effects of ETA on Y (continued)

	IPCLI	FPCLI	AK	EW	PA
ipcY6a	0.421	- -	- -	- -	- -
ipcY7a	0.475	- -	- -	- -	- -
fpcY11a	- -	0.806	- -	- -	- -
fpcY12a	- -	0.783	- -	- -	- -
fpcY13a	- -	0.748	- -	- -	- -
ak6Y19	0.797	0.320	0.905	- -	- -
ak7Y20	0.864	0.347	0.981	- -	- -
ak9Y22	0.819	0.329	0.930	- -	- -
ak10Y23	0.691	0.278	0.785	- -	- -
ew11Y34	0.191	0.141	- -	0.640	- -
ew12Y35	0.109	0.081	- -	0.365	- -
ew24Y38	0.150	0.111	- -	0.502	- -
pa14Y25	0.597	0.418	- -	- -	0.906
pa15Y26	0.578	0.404	- -	- -	0.877
pa16Y27	0.181	0.127	- -	- -	0.275

Completely Standardized Total Effects of ETA on Y

	IPCLI	FPCLI	AK	EW	PA
ipcY6a	0.421	- -	- -	- -	- -
ipcY7a	0.475	- -	- -	- -	- -
fpcY11a	- -	0.806	- -	- -	- -
fpcY12a	- -	0.783	- -	- -	- -
fpcY13a	- -	0.748	- -	- -	- -
ak6Y19	0.797	0.320	0.905	- -	- -
ak7Y20	0.864	0.347	0.981	- -	- -
ak9Y22	0.819	0.329	0.930	- -	- -
ak10Y23	0.691	0.278	0.785	- -	- -
ew11Y34	0.191	0.141	- -	0.640	- -
ew12Y35	0.109	0.081	- -	0.365	- -
ew24Y38	0.150	0.111	- -	0.502	- -
pa14Y25	0.597	0.418	- -	- -	0.906
pa15Y26	0.578	0.404	- -	- -	0.877
pa16Y27	0.181	0.127	- -	- -	0.275

Standardized Indirect Effects of ETA on Y

	IPCLI	FPCLI	AK	EW	PA
ipcY6a	- -	- -	- -	- -	- -
ipcY7a	- -	- -	- -	- -	- -
fpcY11a	- -	- -	- -	- -	- -
fpcY12a	- -	- -	- -	- -	- -
fpcY13a	- -	- -	- -	- -	- -
ak6Y19	0.797	0.320	- -	- -	- -
ak7Y20	0.864	0.347	- -	- -	- -
ak9Y22	0.819	0.329	- -	- -	- -
ak10Y23	0.691	0.278	- -	- -	- -
ew11Y34	0.191	0.141	- -	- -	- -
ew12Y35	0.109	0.081	- -	- -	- -
ew24Y38	0.150	0.111	- -	- -	- -
pa14Y25	0.597	0.418	- -	- -	- -
pa15Y26	0.578	0.404	- -	- -	- -
pa16Y27	0.181	0.127	- -	- -	- -

Completely Standardized Indirect Effects of ETA on Y

	IPCLI	FPCLI	AK	EW	PA
ipcY6a	- -	- -	- -	- -	- -
ipcY7a	- -	- -	- -	- -	- -
fpcY11a	- -	- -	- -	- -	- -
fpcY12a	- -	- -	- -	- -	- -
fpcY13a	- -	- -	- -	- -	- -
ak6Y19	0.797	0.320	- -	- -	- -
ak7Y20	0.864	0.347	- -	- -	- -
ak9Y22	0.819	0.329	- -	- -	- -
ak10Y23	0.691	0.278	- -	- -	- -
ew11Y34	0.191	0.141	- -	- -	- -
ew12Y35	0.109	0.081	- -	- -	- -
ew24Y38	0.150	0.111	- -	- -	- -
pa14Y25	0.597	0.418	- -	- -	- -
pa15Y26	0.578	0.404	- -	- -	- -
pa16Y27	0.181	0.127	- -	- -	- -

Standardized Total Effects of KSI on Y

	PCRQ
ipcY6a	-0.046
ipcY7a	-0.052
fpcY11a	-0.181
fpcY12a	-0.175
fpcY13a	-0.167
ak6Y19	-0.159
ak7Y20	-0.172
ak9Y22	-0.163
ak10Y23	-0.137
ew11Y34	-0.052
ew12Y35	-0.030
ew24Y38	-0.041
pa14Y25	-0.159
pa15Y26	-0.153
pa16Y27	-0.048

Completely Standardized Total Effects of KSI on Y

	PCRQ
ipcY6a	-0.046
ipcY7a	-0.052
fpcY11a	-0.181
fpcY12a	-0.175
fpcY13a	-0.167
ak6Y19	-0.159
ak7Y20	-0.172
ak9Y22	-0.163
ak10Y23	-0.137
ew11Y34	-0.052
ew12Y35	-0.030
ew24Y38	-0.041
pa14Y25	-0.159
pa15Y26	-0.153
pa16Y27	-0.048

Time used: 0.953 Seconds

Appendix F: LISREL 8.80 for testing the HLR Mediation Structural Model

F.1 PRELIS 2.80: PRELIS results for the 16-item HLR measurement model;

F.2 LISREL 8.80: CFA results for testing the 5-factor HLR measurement model;

F.3 LISREL 8.80: SEM results for testing the 5-factor HLR structural model

DATE: 03/18/2014
TIME: 15:42

P R E L I S 2.80

BY

Karl G. Jöreskog and Dag Sörbom

The following lines were read from file **E:\9SEM1-HLR_1403\HLR_Model-16Item.PR2:**

```
!HLR_Model: PRELIS Run
!Compute Polychoric Correlations and Asymptotic Covariance Matrix
 SY='E:\9SEM1-HLR_1403\HLR_Model-16Item.PSF'
 OU MA=PM PM=HLR_Model.PM AC=HLR_Model.ACP
```

Total Sample Size = 411

Univariate Marginal Parameters

Variable	Mean	St. Dev.	Thresholds				
pcr17X2	0.000	1.000	-2.816	-2.065	-1.612	-1.167	0.187
pcr19X4	0.000	1.000	-2.442	-1.824	-0.776		
pcr20X5	0.000	1.000	-2.816	-1.931	-0.680		
pcr21X6	0.000	1.000	-2.816	-2.442	-2.337	-1.824	-0.534
hlrY2a	0.000	1.000	-0.642	0.288	1.043		
hlrY3a	0.000	1.000	-1.824	-0.727	0.358	0.992	
ak6Y19	0.000	1.000	-1.120				
ak7Y20	0.000	1.000	-1.454				
ak9Y22	0.000	1.000	-0.809				
ak10Y23	0.000	1.000	-0.759				
ew11Y34	0.000	1.000	-0.792				
ew12Y35	0.000	1.000	-0.358				
ew24Y38	0.000	1.000	0.064				
pa14Y25	0.000	1.000	-0.499				
pa15Y26	0.000	1.000	-0.776				
pa16Y27	0.000	1.000	0.499				

Univariate Distributions for Ordinal Variables

pcr17X2	Freq.	Perc.	Bar Chart
2	1	0.2	▯
3	7	1.7	▯▯
4	14	3.4	▯▯▯▯
5	28	6.8	▯▯▯▯▯▯▯
6	186	45.3	▯▯▯
7	175	42.6	▯▯

pcr19X4	Freq.	Perc.	Bar Chart
4	3	0.7	▯
5	11	2.7	▯▯
6	76	18.5	▯▯▯▯▯▯▯▯▯▯▯
7	321	78.1	▯▯▯

pcr20X5	Freq.	Perc.	Bar Chart
3	1	0.2	▯
5	10	2.4	▯▯
6	91	22.1	▯▯▯▯▯▯▯▯▯▯▯▯▯▯
7	309	75.2	▯▯▯

pcr21X6	Freq.	Perc.	Bar Chart
2	1	0.2	▯
3	2	0.5	▯
4	1	0.2	▯
5	10	2.4	▯▯
6	108	26.3	▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯
7	289	70.3	▯▯▯

hlrY2a	Freq.	Perc.	Bar Chart
2	107	26.0	▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯
3	145	35.3	▯▯▯
4	98	23.8	▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯
5	61	14.8	▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯

hlrY3a	Freq.	Perc.	Bar Chart
1	14	3.4	▯▯▯▯
2	82	20.0	▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯
3	167	40.6	▯▯▯
4	82	20.0	▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯
5	66	16.1	▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯

ak6Y19	Freq.	Perc.	Bar Chart
0	54	13.1	▯▯▯▯▯▯▯
1	357	86.9	▯▯▯

ak7Y20	Freq.	Perc.	Bar Chart
0	30	7.3	▯▯▯▯
1	381	92.7	▯▯▯

ak9Y22	Freq.	Perc.	Bar Chart
0	86	20.9	▯▯▯▯▯▯▯▯▯▯▯▯
1	325	79.1	▯▯▯

ak10Y23	Freq.	Perc.	Bar Chart
0	92	22.4	▯▯▯▯▯▯▯▯▯▯▯▯▯▯
1	319	77.6	▯▯▯

ew11Y34	Freq.	Perc.	Bar Chart
0	88	21.4	▯▯▯▯▯▯▯▯▯▯▯▯▯
1	323	78.6	▯▯▯

ew12Y35	Freq.	Perc.	Bar Chart
0	148	36.0	▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯
1	263	64.0	▯▯▯

ew24Y38	Freq.	Perc.	Bar Chart
0	216	52.6	▯▯▯
1	195	47.4	▯▯

pa14Y25	Freq.	Perc.	Bar Chart
0	127	30.9	▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯
1	284	69.1	▯▯▯

pa15Y26	Freq.	Perc.	Bar Chart
0	90	21.9	▯▯▯▯▯▯▯▯▯▯▯▯▯
1	321	78.1	▯▯▯

pa16Y27	Freq.	Perc.	Bar Chart
0	284	69.1	▯▯▯
1	127	30.9	▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯▯

There ar	Freq.	Perc.		Bar Chart
The	20	most	▯▯▯▯▯▯	
4	7	7	▯	
0			▯	
3	6	7	▯	
1			▯	
3	7	7	▯	
1			▯	
2	6	7	▯	
1			▯	
2	6	7	▯	
1			▯	
2	6	7	▯	
1			▯	
2	7	7	▯	
1			▯	
2	7	7	▯	
1			▯	
2	6	7	▯	
1			▯	
2	6	7	▯	
1			▯	
2	6	7	▯	
1			▯	
2	7	7	▯	
0			▯	
2	7	7	▯	
1			▯	
2	6	7	▯	
0			▯	
2	5	7	▯	
0			▯	
2	7	7	▯	
0			▯	
2	7	7	▯	
0			▯	
2	7	7	▯	
0			▯	
2	7	7	▯	
0			▯	
2	7	7	▯	
0			▯	

Correlations and Test Statistics

(PE=Pearson Product Moment, PC=Polychoric, PS=Polyserial)

Variable	vs.	Variable	Correlation	Chi-Squ.	Test of Model D.F.	Test of Model P-Value	Test of Close Fit RMSEA	Test of Close Fit P-Value
pcr19X4	vs.	pcr17X2	0.637 (PC)	15.875	14	0.321	0.018	1.000
pcr20X5	vs.	pcr17X2	0.646 (PC)	27.945	14	0.014	0.049	1.000
pcr20X5	vs.	pcr19X4	0.728 (PC)	5.814	8	0.668	0.000	1.000
pcr21X6	vs.	pcr17X2	0.669 (PC)	33.460	24	0.095	0.031	1.000
pcr21X6	vs.	pcr19X4	0.759 (PC)	19.908	14	0.133	0.032	1.000
pcr21X6	vs.	pcr20X5	0.920 (PC)	13.079	14	0.520	0.000	1.000
hlrY2a	vs.	pcr17X2	-0.009 (PC)	11.926	14	0.612	0.000	1.000
hlrY2a	vs.	pcr19X4	0.029 (PC)	4.040	8	0.853	0.000	1.000
hlrY2a	vs.	pcr20X5	0.188 (PC)	8.397	8	0.396	0.011	1.000
hlrY2a	vs.	pcr21X6	0.196 (PC)	12.837	14	0.539	0.000	1.000
hlrY3a	vs.	pcr17X2	0.014 (PC)	21.550	19	0.307	0.018	1.000
hlrY3a	vs.	pcr19X4	-0.005 (PC)	11.310	11	0.418	0.008	1.000
hlrY3a	vs.	pcr20X5	0.027 (PC)	5.529	11	0.903	0.000	1.000
hlrY3a	vs.	pcr21X6	0.033 (PC)	17.622	19	0.548	0.000	1.000
hlrY3a	vs.	hlrY2a	0.294 (PC)	16.366	11	0.128	0.034	1.000
ak6Y19	vs.	pcr17X2	-0.151 (PC)	5.588	4	0.232	0.031	0.985
ak6Y19	vs.	pcr19X4	-0.274 (PC)	1.220	2	0.543	0.000	0.980
ak6Y19	vs.	pcr20X5	-0.126 (PC)	0.194	2	0.907	0.000	0.998
ak6Y19	vs.	pcr21X6	-0.135 (PC)	2.613	4	0.625	0.000	0.999
ak6Y19	vs.	hlrY2a	0.179 (PC)	3.063	2	0.216	0.036	0.911
ak6Y19	vs.	hlrY3a	0.248 (PC)	1.913	3	0.591	0.000	0.995
ak7Y20	vs.	pcr17X2	-0.039 (PC)	5.651	4	0.227	0.032	0.985
ak7Y20	vs.	pcr19X4	-0.006 (PC)	2.382	2	0.304	0.022	0.942
ak7Y20	vs.	pcr20X5	-0.017 (PC)	0.308	2	0.857	0.000	0.997
ak7Y20	vs.	pcr21X6	0.055 (PC)	4.430	4	0.351	0.016	0.993
ak7Y20	vs.	hlrY2a	0.216 (PC)	0.019	2	0.991	0.000	1.000
ak7Y20	vs.	hlrY3a	0.151 (PC)	1.292	3	0.731	0.000	0.998
ak7Y20	vs.	ak6Y19	0.756 (PC)	0.000	0	1.000	0.000	1.000
ak9Y22	vs.	pcr17X2	-0.180 (PC)	7.789	4	0.100	0.048	0.957
ak9Y22	vs.	pcr19X4	-0.135 (PC)	1.181	2	0.554	0.000	0.981
ak9Y22	vs.	pcr20X5	-0.157 (PC)	0.269	2	0.874	0.000	0.997
ak9Y22	vs.	pcr21X6	-0.083 (PC)	5.891	4	0.207	0.034	0.983
ak9Y22	vs.	hlrY2a	0.170 (PC)	0.067	2	0.967	0.000	0.999
ak9Y22	vs.	hlrY3a	0.137 (PC)	4.986	3	0.173	0.040	0.950
ak9Y22	vs.	ak6Y19	0.666 (PC)	0.000	0	1.000	0.040	1.000
ak9Y22	vs.	ak7Y20	0.427 (PC)	0.000	0	1.000	0.040	1.000
ak10Y23	vs.	pcr17X2	-0.103 (PC)	4.967	4	0.291	0.024	0.990
ak10Y23	vs.	pcr19X4	-0.047 (PC)	3.176	2	0.204	0.038	0.905
ak10Y23	vs.	pcr20X5	-0.105 (PC)	1.888	2	0.389	0.000	0.960
ak10Y23	vs.	pcr21X6	-0.128 (PC)	1.651	4	0.800	0.000	1.000
ak10Y23	vs.	hlrY2a	0.211 (PC)	0.180	2	0.914	0.000	0.998
ak10Y23	vs.	hlrY3a	0.115 (PC)	5.277	3	0.153	0.043	0.942
ak10Y23	vs.	ak6Y19	0.521 (PC)	0.000	0	1.000	0.043	1.000
ak10Y23	vs.	ak7Y20	0.441 (PC)	0.000	0	1.000	0.043	1.000
ak10Y23	vs.	ak9Y22	0.477 (PC)	0.000	0	1.000	0.043	1.000
ew11Y34	vs.	pcr17X2	0.066 (PC)	7.967	4	0.093	0.049	0.954
ew11Y34	vs.	pcr19X4	0.071 (PC)	2.520	2	0.284	0.025	0.936
ew11Y34	vs.	pcr20X5	0.090 (PC)	2.702	2	0.259	0.029	0.928
ew11Y34	vs.	pcr21X6	0.071 (PC)	1.855	4	0.762	0.000	1.000
ew11Y34	vs.	hlrY2a	0.030 (PC)	0.621	2	0.733	0.000	0.992
ew11Y34	vs.	hlrY3a	0.100 (PC)	0.783	3	0.853	0.000	0.999
ew11Y34	vs.	ak6Y19	0.162 (PC)	0.000	0	1.000	0.000	1.000
ew11Y34	vs.	ak7Y20	0.242 (PC)	0.000	0	1.000	0.000	1.000
ew11Y34	vs.	ak9Y22	0.180 (PC)	0.000	0	1.000	0.000	1.000
ew11Y34	vs.	ak10Y23	0.192 (PC)	0.000	0	1.000	0.000	1.000

ew12Y35	vs.	pcr17X2	0.057 (PC)	8.617	4	0.071	0.053	0.940
ew12Y35	vs.	pcr19X4	0.158 (PC)	4.986	2	0.083	0.060	0.799
ew12Y35	vs.	pcr20X5	0.037 (PC)	1.069	2	0.586	0.000	0.984
ew12Y35	vs.	pcr21X6	0.075 (PC)	8.081	4	0.089	0.050	0.951
ew12Y35	vs.	hlrY2a	0.135 (PC)	3.537	2	0.171	0.043	0.886
ew12Y35	vs.	hlrY3a	0.067 (PC)	0.470	3	0.925	0.000	1.000
ew12Y35	vs.	ak6Y19	0.164 (PC)	0.000	0	1.000	0.000	1.000
ew12Y35	vs.	ak7Y20	0.055 (PC)	0.000	0	1.000	0.000	1.000
ew12Y35	vs.	ak9Y22	0.068 (PC)	0.000	0	1.000	0.000	1.000
ew12Y35	vs.	ak10Y23	0.208 (PC)	0.000	0	1.000	0.000	1.000
ew12Y35	vs.	ew11Y34	0.304 (PC)	0.000	0	1.000	0.000	1.000
ew24Y38	vs.	pcr17X2	0.033 (PC)	2.207	4	0.698	0.000	0.999
ew24Y38	vs.	pcr19X4	-0.023 (PC)	0.460	2	0.795	0.000	0.995
ew24Y38	vs.	pcr20X5	-0.120 (PC)	1.032	2	0.597	0.000	0.984
ew24Y38	vs.	pcr21X6	-0.025 (PC)	2.751	4	0.600	0.000	0.999
ew24Y38	vs.	hlrY2a	0.108 (PC)	0.297	2	0.862	0.000	0.997
ew24Y38	vs.	hlrY3a	0.088 (PC)	8.434	3	0.038	0.066	0.823
ew24Y38	vs.	ak6Y19	0.104 (PC)	0.000	0	1.000	0.066	1.000
ew24Y38	vs.	ak7Y20	0.010 (PC)	0.000	0	1.000	0.066	1.000
ew24Y38	vs.	ak9Y22	0.316 (PC)	0.000	0	1.000	0.066	1.000
ew24Y38	vs.	ak10Y23	0.095 (PC)	0.000	0	1.000	0.066	1.000
ew24Y38	vs.	ew11Y34	0.268 (PC)	0.000	0	1.000	0.066	1.000
ew24Y38	vs.	ew12Y35	0.231 (PC)	0.000	0	1.000	0.066	1.000
pa14Y25	vs.	pcr17X2	-0.091 (PC)	3.086	4	0.544	0.000	0.998
pa14Y25	vs.	pcr19X4	-0.111 (PC)	2.437	2	0.296	0.023	0.939
pa14Y25	vs.	pcr20X5	-0.032 (PC)	1.250	2	0.535	0.000	0.979
pa14Y25	vs.	pcr21X6	-0.029 (PC)	12.394	4	0.015	0.071	0.825
pa14Y25	vs.	hlrY2a	0.134 (PC)	1.408	2	0.494	0.000	0.975
pa14Y25	vs.	hlrY3a	0.020 (PC)	7.520	3	0.057	0.061	0.864
pa14Y25	vs.	ak6Y19	0.362 (PC)	0.000	0	1.000	0.061	1.000
pa14Y25	vs.	ak7Y20	0.219 (PC)	0.000	0	1.000	0.061	1.000
pa14Y25	vs.	ak9Y22	0.554 (PC)	0.000	0	1.000	0.061	1.000
pa14Y25	vs.	ak10Y23	0.487 (PC)	0.000	0	1.000	0.061	1.000
pa14Y25	vs.	ew11Y34	0.156 (PC)	0.000	0	1.000	0.061	1.000
pa14Y25	vs.	ew12Y35	0.273 (PC)	0.000	0	1.000	0.061	1.000
pa14Y25	vs.	ew24Y38	0.246 (PC)	0.000	0	1.000	0.061	1.000
pa15Y26	vs.	pcr17X2	-0.114 (PC)	0.635	4	0.959	0.000	1.000
pa15Y26	vs.	pcr19X4	0.038 (PC)	7.412	2	0.025	0.081	0.628
pa15Y26	vs.	pcr20X5	-0.057 (PC)	1.140	2	0.566	0.000	0.982
pa15Y26	vs.	pcr21X6	0.019 (PC)	7.736	4	0.102	0.048	0.958
pa15Y26	vs.	hlrY2a	0.271 (PC)	1.595	2	0.450	0.000	0.970
pa15Y26	vs.	hlrY3a	0.120 (PC)	11.487	3	0.009	0.083	0.661
pa15Y26	vs.	ak6Y19	0.426 (PC)	0.000	0	1.000	0.083	1.000
pa15Y26	vs.	ak7Y20	0.367 (PC)	0.000	0	1.000	0.083	1.000
pa15Y26	vs.	ak9Y22	0.605 (PC)	0.000	0	1.000	0.083	1.000
pa15Y26	vs.	ak10Y23	0.549 (PC)	0.000	0	1.000	0.083	1.000
pa15Y26	vs.	ew11Y34	0.180 (PC)	0.000	0	1.000	0.083	1.000
pa15Y26	vs.	ew12Y35	0.246 (PC)	0.000	0	1.000	0.083	1.000
pa15Y26	vs.	ew24Y38	0.243 (PC)	0.000	0	1.000	0.083	1.000
pa15Y26	vs.	pa14Y25	0.700 (PC)	0.000	0	1.000	0.083	1.000
pa16Y27	vs.	pcr17X2	-0.024 (PC)	5.126	4	0.275	0.026	0.989
pa16Y27	vs.	pcr19X4	-0.038 (PC)	5.281	2	0.071	0.063	0.779
pa16Y27	vs.	pcr20X5	0.111 (PC)	0.535	2	0.765	0.000	0.994
pa16Y27	vs.	pcr21X6	0.053 (PC)	2.598	4	0.627	0.000	0.999
pa16Y27	vs.	hlrY2a	0.027 (PC)	0.602	2	0.740	0.000	0.993
pa16Y27	vs.	hlrY3a	0.057 (PC)	3.676	3	0.299	0.023	0.976
pa16Y27	vs.	ak6Y19	0.159 (PC)	0.000	0	1.000	0.023	1.000
pa16Y27	vs.	ak7Y20	-0.084 (PC)	0.000	0	1.000	0.023	1.000
pa16Y27	vs.	ak9Y22	0.268 (PC)	0.000	0	1.000	0.023	1.000
pa16Y27	vs.	ak10Y23	0.202 (PC)	0.000	0	1.000	0.023	1.000
pa16Y27	vs.	ew11Y34	0.176 (PC)	0.000	0	1.000	0.023	1.000

pa16Y27	**vs.**	**ew12Y35**	0.163 (PC)	0.000	0	1.000	0.023	1.000
pa16Y27	**vs.**	**ew24Y38**	0.236 (PC)	0.000	0	1.000	0.023	1.000
pa16Y27	**vs.**	**pa14Y25**	0.393 (PC)	0.000	0	1.000	0.023	1.000
pa16Y27	**vs.**	**pa15Y26**	0.346 (PC)	0.000	0	1.000	0.023	1.000

Percentage of Tests Exceeding 0.5% Significance Level: 0.0%

Percentage of Tests Exceeding 1.0% Significance Level: 0.0%

Percentage of Tests Exceeding 5.0% Significance Level: 0.0%

Correlation Matrix

	pcr17X2	pcr19X4	pcr20X5	pcr21X6	hlrY2a	hlrY3a
pcr17X2	1.000					
pcr19X4	0.637	1.000				
pcr20X5	0.646	0.728	1.000			
pcr21X6	0.669	0.759	0.920	1.000		
hlrY2a	-0.009	0.029	0.188	0.196	1.000	
hlrY3a	0.014	-0.005	0.027	0.033	0.294	1.000
ak6Y19	-0.151	-0.274	-0.126	-0.135	0.179	0.248
ak7Y20	-0.039	-0.006	-0.017	0.055	0.216	0.151
ak9Y22	-0.180	-0.135	-0.157	-0.083	0.170	0.137
ak10Y23	-0.103	-0.047	-0.105	-0.128	0.211	0.115
ew11Y34	0.066	0.071	0.090	0.071	0.030	0.100
ew12Y35	0.057	0.158	0.037	0.075	0.135	0.067
ew24Y38	0.033	-0.023	-0.120	-0.025	0.108	0.088
pa14Y25	-0.091	-0.111	-0.032	-0.029	0.134	0.020
pa15Y26	-0.114	0.038	-0.057	0.019	0.271	0.120
pa16Y27	-0.024	-0.038	0.111	0.053	0.027	0.057

Correlation Matrix (continued)

	ak6Y19	ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35
ak6Y19	1.000					
ak7Y20	0.756	1.000				
ak9Y22	0.666	0.427	1.000			
ak10Y23	0.521	0.441	0.477	1.000		
ew11Y34	0.162	0.242	0.180	0.192	1.000	
ew12Y35	0.164	0.055	0.068	0.208	0.304	1.000
ew24Y38	0.104	0.010	0.316	0.095	0.268	0.231
pa14Y25	0.362	0.219	0.554	0.487	0.156	0.273
pa15Y26	0.426	0.367	0.605	0.549	0.180	0.246
pa16Y27	0.159	-0.084	0.268	0.202	0.176	0.163

Correlation Matrix (continued)

	ew24Y38	pa14Y25	pa15Y26	pa16Y27
ew24Y38	1.000			
pa14Y25	0.246	1.000		
pa15Y26	0.243	0.700	1.000	
pa16Y27	0.236	0.393	0.346	1.000

Means

pcr17X2	pcr19X4	pcr20X5	pcr21X6	hlrY2a	hlrY3a
0.000	0.000	0.000	0.000	0.000	0.000

Means (continued)

ak6Y19	ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35
0.000	0.000	0.000	0.000	0.000	0.000

Means (continued)

ew24Y38	pa14Y25	pa15Y26	pa16Y27
0.000	0.000	0.000	0.000

Standard Deviations

pcr17X2	pcr19X4	pcr20X5	pcr21X6	hlrY2a	hlrY3a
1.000	1.000	1.000	1.000	1.000	1.000

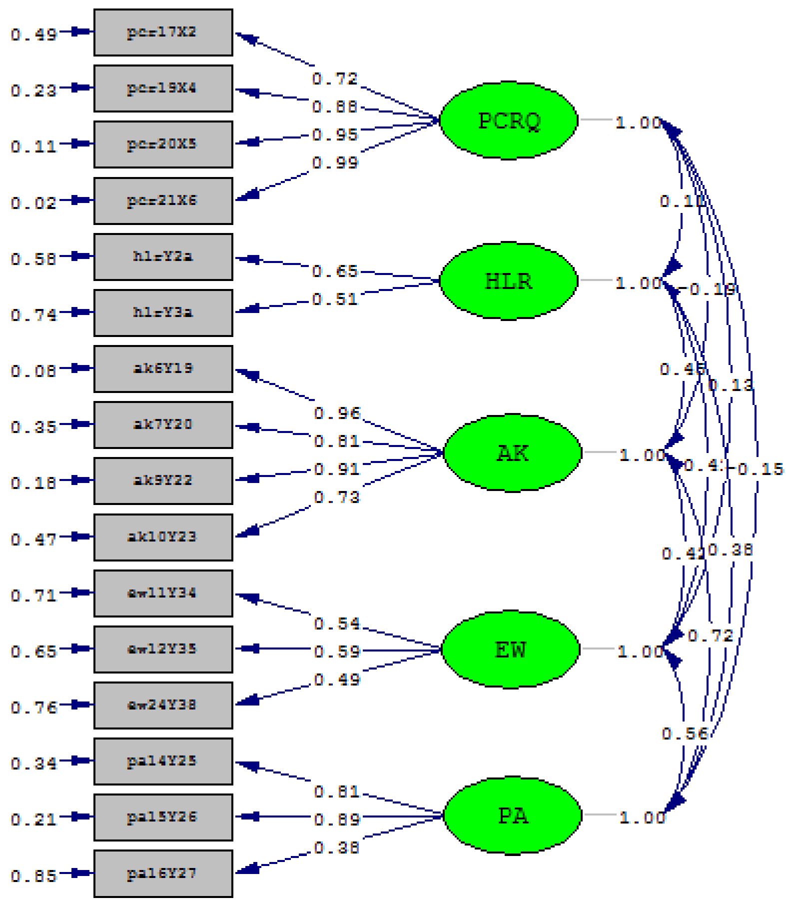
Standard Deviations (continued)

ak6Y19	ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35
1.000	1.000	1.000	1.000	1.000	1.000

Standard Deviations (continued)

ew24Y38	pa14Y25	pa15Y26	pa16Y27
1.000	1.000	1.000	1.000

The Problem used 105504 Bytes (= 0.0% of available workspace)



Chi-Square=151.21, df=94, P-value=0.00017, RMSEA=0.039

DATE: 3/18/2014
TIME: 16:08

L I S R E L 8.80

BY

Karl G. Jöreskog and Dag Sörbom

The following lines were read from file **E:\9SEM1-HLR_1403\HLR_Model-CFA.Spl:**

```
!HLR_Model: LISREL Run 1
!Test Five-Factor HLR Full Measurement Model: CFA Model M1(16-item)
 Observed Variables: pcr17X2 pcr19X4 pcr20X5 pcr21X6 hlrY2a hlrY3a ak6Y19 ak7Y20 ak9Y22
ak10Y23 ew11Y34 ew12Y35 ew24Y38 pa14Y25 pa15Y26 pa16Y27
 Correlation Matrix from File HLR_Model.PM
 Asymptotic Covariance Matrix from File HLR_Model.ACP
 Sample Size: 411
 Latent Variables: PCRQ HLR AK EW PA
 Relationships:
 pcr17X2 pcr19X4 pcr20X5 pcr21X6 = PCRQ
 hlrY2a hlrY3a = HLR
 ak6Y19 ak7Y20 ak9Y22 ak10Y23 = AK
 ew11Y34 ew12Y35 ew24Y38 = EW
 pa14Y25 pa15Y26 pa16Y27 = PA
 LISREL Output: ME=WL ND=3 SC RS MI
 Path Diagram
 End of Problem
6.6in.02in
```

Correlation Matrix

	pcr17X2	pcr19X4	pcr20X5	pcr21X6	hlrY2a	hlrY3a
pcr17X2	1.000					
pcr19X4	0.637	1.000				
pcr20X5	0.646	0.728	1.000			
pcr21X6	0.669	0.759	0.920	1.000		
hlrY2a	-0.009	0.029	0.188	0.196	1.000	
hlrY3a	0.014	-0.005	0.027	0.033	0.294	1.000
ak6Y19	-0.151	-0.274	-0.126	-0.135	0.179	0.248
ak7Y20	-0.039	-0.006	-0.017	0.055	0.216	0.151
ak9Y22	-0.180	-0.135	-0.157	-0.083	0.170	0.137
ak10Y23	-0.103	-0.047	-0.105	-0.128	0.211	0.115
ew11Y34	0.066	0.071	0.090	0.071	0.030	0.100
ew12Y35	0.057	0.158	0.037	0.075	0.135	0.067
ew24Y38	0.033	-0.023	-0.120	-0.025	0.108	0.088
pa14Y25	-0.091	-0.111	-0.032	-0.029	0.134	0.020
pa15Y26	-0.114	0.038	-0.057	0.019	0.271	0.120
pa16Y27	-0.024	-0.038	0.111	0.053	0.027	0.057

Correlation Matrix (continued)

	ak6Y19	ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35
ak6Y19	1.000					
ak7Y20	0.756	1.000				
ak9Y22	0.666	0.427	1.000			
ak10Y23	0.521	0.441	0.477	1.000		
ew11Y34	0.162	0.242	0.180	0.192	1.000	
ew12Y35	0.164	0.055	0.068	0.208	0.304	1.000
ew24Y38	0.104	0.010	0.316	0.095	0.268	0.231
pa14Y25	0.362	0.219	0.554	0.487	0.156	0.273
pa15Y26	0.426	0.367	0.605	0.549	0.180	0.246
pa16Y27	0.159	-0.084	0.268	0.202	0.176	0.163

Correlation Matrix (continued)

	ew24Y38	pa14Y25	pa15Y26	pa16Y27
ew24Y38	1.000			
pa14Y25	0.246	1.000		
pa15Y26	0.243	0.700	1.000	
pa16Y27	0.236	0.393	0.346	1.000

Parameter Specifications

LAMBDA-X

	PCRQ	HLR	AK	EW	PA
pcr17X2	1	0	0	0	0
pcr19X4	2	0	0	0	0
pcr20X5	3	0	0	0	0
pcr21X6	4	0	0	0	0
hlrY2a	0	5	0	0	0
hlrY3a	0	6	0	0	0
ak6Y19	0	0	7	0	0
ak7Y20	0	0	8	0	0
ak9Y22	0	0	9	0	0
ak10Y23	0	0	10	0	0
ew11Y34	0	0	0	11	0
ew12Y35	0	0	0	12	0
ew24Y38	0	0	0	13	0
pa14Y25	0	0	0	0	14
pa15Y26	0	0	0	0	15
pa16Y27	0	0	0	0	16

PHI

	PCRQ	HLR	AK	EW	PA
PCRQ	0				
HLR	17	0			
AK	18	19	0		
EW	20	21	22	0	
PA	23	24	25	26	0

THETA-DELTA

pcr17X2	pcr19X4	pcr20X5	pcr21X6	hlrY2a	hlrY3a
27	28	29	30	31	32

THETA-DELTA (continued)

ak6Y19	ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35
33	34	35	36	37	38

THETA-DELTA (continued)

ew24Y38	pa14Y25	pa15Y26	pa16Y27
39	40	41	42

!HLR Model: LISREL Run 1

Number of Iterations = 15

LISREL Estimates (Weighted Least Squares)

LAMBDA-X

	PCRQ	HLR	AK	EW	PA
pcr17X2	0.715	- -	- -	- -	- -
	(0.033)				
	21.946				
pcr19X4	0.876	- -	- -	- -	- -
	(0.028)				
	31.447				
pcr20X5	0.946	- -	- -	- -	- -
	(0.016)				
	59.599				
pcr21X6	0.988	- -	- -	- -	- -
	(0.014)				
	69.174				
hlrY2a	- -	0.646	- -	- -	- -
		(0.071)			
		9.042			
hlrY3a	- -	0.510	- -	- -	- -
		(0.061)			
		8.319			
ak6Y19	- -	- -	0.959	- -	- -
			(0.034)		
			28.519		
ak7Y20	- -	- -	0.809	- -	- -
			(0.054)		
			14.906		
ak9Y22	- -	- -	0.907	- -	- -
			(0.039)		
			23.346		
ak10Y23	- -	- -	0.730	- -	- -
			(0.046)		
			15.866		
ew11Y34	- -	- -	- -	0.542	- -
				(0.076)	
				7.107	
ew12Y35	- -	- -	- -	0.590	- -
				(0.075)	
				7.892	
ew24Y38	- -	- -	- -	0.494	- -
				(0.071)	
				6.954	
pa14Y25	- -	- -	- -	- -	0.813
					(0.044)
					18.363
pa15Y26	- -	- -	- -	- -	0.891
					(0.042)
					21.429
pa16Y27	- -	- -	- -	- -	0.381
					(0.060)
					6.336

PHI

	PCRQ	HLR	AK	EW	PA
PCRQ	1.000				
HLR	0.114	1.000			
	(0.071)				
	1.619				
AK	-0.187	0.448	1.000		
	(0.051)	(0.074)			
	-3.687	6.092			
EW	0.132	0.409	0.416	1.000	
	(0.076)	(0.108)	(0.074)		
	1.749	3.782	5.592		
PA	-0.149	0.375	0.723	0.565	1.000
	(0.060)	(0.077)	(0.043)	(0.081)	
	-2.485	4.848	16.953	6.973	

THETA-DELTA

pcr17X2	pcr19X4	pcr20X5	pcr21X6	hlrY2a	hlrY3a
0.489	0.232	0.106	0.024	0.582	0.740
(0.068)	(0.069)	(0.058)	(0.057)	(0.105)	(0.080)
7.197	3.344	1.832	0.428	5.557	9.293

THETA-DELTA (continued)

ak6Y19	ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35
0.081	0.346	0.178	0.467	0.706	0.652
(0.081)	(0.101)	(0.086)	(0.083)	(0.096)	(0.101)
0.992	3.433	2.067	5.592	7.332	6.457

THETA-DELTA (continued)

ew24Y38	pa14Y25	pa15Y26	pa16Y27
0.756	0.340	0.207	0.855
(0.086)	(0.087)	(0.089)	(0.067)
8.821	3.893	2.322	12.691

Squared Multiple Correlations for X - Variables

pcr17X2	pcr19X4	pcr20X5	pcr21X6	hlrY2a	hlrY3a
0.511	0.768	0.894	0.976	0.418	0.260

Squared Multiple Correlations for X - Variables (continued)

ak6Y19	ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35
0.919	0.654	0.822	0.533	0.294	0.348

Squared Multiple Correlations for X - Variables (continued)

ew24Y38	pa14Y25	pa15Y26	pa16Y27
0.244	0.660	0.793	0.145

Goodness of Fit Statistics

```
Degrees of Freedom = 94
Minimum Fit Function Chi-Square = 151.209 (P = 0.000168)
Estimated Non-centrality Parameter (NCP) = 57.209
90 Percent Confidence Interval for NCP = (27.525 ; 94.809)

Minimum Fit Function Value = 0.369
Population Discrepancy Function Value (F0) = 0.140
90 Percent Confidence Interval for F0 = (0.0671 ; 0.231)
Root Mean Square Error of Approximation (RMSEA) = 0.0385
90 Percent Confidence Interval for RMSEA = (0.0267 ; 0.0496)
P-Value for Test of Close Fit (RMSEA < 0.05) = 0.956

Expected Cross-Validation Index (ECVI) = 0.574
90 Percent Confidence Interval for ECVI = (0.501 ; 0.665)
ECVI for Saturated Model = 0.663
ECVI for Independence Model = 15.030

Chi-Square for Independence Model with 120 Degrees of Freedom = 6130.471
Independence AIC = 6162.471
Model AIC = 235.209
Saturated AIC = 272.000
Independence CAIC = 6242.769
Model CAIC = 445.990
Saturated CAIC = 954.529

Normed Fit Index (NFI) = 0.975
Non-Normed Fit Index (NNFI) = 0.988
Parsimony Normed Fit Index (PNFI) = 0.764
Comparative Fit Index (CFI) = 0.990
Incremental Fit Index (IFI) = 0.991
Relative Fit Index (RFI) = 0.969

Critical N (CN) = 350.254


Root Mean Square Residual (RMR) = 0.0895
Standardized RMR = 0.0895
Goodness of Fit Index (GFI) = 0.988
Adjusted Goodness of Fit Index (AGFI) = 0.983
Parsimony Goodness of Fit Index (PGFI) = 0.683
```

Fitted Covariance Matrix

	pcr17X2	pcr19X4	pcr20X5	pcr21X6	hlrY2a	hlrY3a
pcr17X2	1.000					
pcr19X4	0.627	1.000				
pcr20X5	0.676	0.829	1.000			
pcr21X6	0.706	0.865	0.934	1.000		
hlrY2a	0.053	0.065	0.070	0.073	1.000	
hlrY3a	0.042	0.051	0.055	0.058	0.330	1.000
ak6Y19	-0.128	-0.157	-0.170	-0.177	0.278	0.219
ak7Y20	-0.108	-0.133	-0.143	-0.150	0.234	0.185
ak9Y22	-0.121	-0.149	-0.161	-0.168	0.262	0.207
ak10Y23	-0.098	-0.120	-0.129	-0.135	0.211	0.167
ew11Y34	0.051	0.063	0.068	0.071	0.143	0.113
ew12Y35	0.056	0.068	0.074	0.077	0.156	0.123
ew24Y38	0.047	0.057	0.062	0.064	0.130	0.103
pa14Y25	-0.086	-0.106	-0.114	-0.119	0.197	0.155
pa15Y26	-0.095	-0.116	-0.125	-0.131	0.216	0.170
pa16Y27	-0.040	-0.050	-0.054	-0.056	0.092	0.073

Fitted Covariance Matrix (continued)

	ak6Y19	ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35
ak6Y19	1.000					
ak7Y20	0.776	1.000				
ak9Y22	0.869	0.733	1.000			
ak10Y23	0.700	0.591	0.662	1.000		
ew11Y34	0.216	0.182	0.204	0.165	1.000	
ew12Y35	0.235	0.198	0.222	0.179	0.320	1.000
ew24Y38	0.197	0.166	0.186	0.150	0.268	0.291
pa14Y25	0.564	0.476	0.533	0.429	0.249	0.271
pa15Y26	0.618	0.521	0.584	0.471	0.273	0.297
pa16Y27	0.264	0.223	0.250	0.201	0.117	0.127

Fitted Covariance Matrix (continued)

	ew24Y38	pa14Y25	pa15Y26	pa16Y27
ew24Y38	1.000			
pa14Y25	0.227	1.000		
pa15Y26	0.248	0.724	1.000	
pa16Y27	0.106	0.310	0.339	1.000

Fitted Residuals

	pcr17X2	pcr19X4	pcr20X5	pcr21X6	hlrY2a	hlrY3a
pcr17X2	0.000					
pcr19X4	0.011	0.000				
pcr20X5	-0.030	-0.101	0.000			
pcr21X6	-0.038	-0.107	-0.014	0.000		
hlrY2a	-0.062	-0.036	0.118	0.123	0.000	
hlrY3a	-0.028	-0.056	-0.028	-0.024	-0.035	0.000
ak6Y19	-0.023	-0.116	0.043	0.042	-0.099	0.030
ak7Y20	0.069	0.127	0.126	0.205	-0.018	-0.033

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ak9Y22	-0.058	0.014	0.003	0.085	-0.093	-0.070
ak10Y23	-0.005	0.073	0.024	0.007	0.000	-0.052
ew11Y34	0.015	0.008	0.022	0.001	-0.113	-0.013
ew12Y35	0.001	0.089	-0.036	-0.002	-0.020	-0.056
ew24Y38	-0.014	-0.080	-0.181	-0.089	-0.023	-0.015
pa14Y25	-0.004	-0.005	0.082	0.090	-0.063	-0.135
pa15Y26	-0.019	0.154	0.069	0.149	0.055	-0.051
pa16Y27	0.016	0.012	0.164	0.109	-0.066	-0.016

Fitted Residuals (continued)

	ak6Y19	ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35
ak6Y19	0.000					
ak7Y20	-0.019	0.000				
ak9Y22	-0.204	-0.307	0.000			
ak10Y23	-0.180	-0.150	-0.185	0.000		
ew11Y34	-0.054	0.060	-0.024	0.028	0.000	
ew12Y35	-0.071	-0.143	-0.154	0.029	-0.016	0.000
ew24Y38	-0.092	-0.156	0.130	-0.055	0.000	-0.060
pa14Y25	-0.201	-0.256	0.021	0.057	-0.093	0.002
pa15Y26	-0.192	-0.154	0.021	0.078	-0.093	-0.051
pa16Y27	-0.105	-0.307	0.018	0.001	0.060	0.036

Fitted Residuals (continued)

	ew24Y38	pa14Y25	pa15Y26	pa16Y27
ew24Y38	0.000			
pa14Y25	0.020	0.000		
pa15Y26	-0.006	-0.024	0.000	
pa16Y27	0.130	0.083	0.006	0.000

Summary Statistics for Fitted Residuals

```
Smallest Fitted Residual =  -0.307
  Median Fitted Residual =  -0.003
 Largest Fitted Residual =   0.205
```

Stemleaf Plot

```
- 3|11
- 2|6
- 2|00
- 1|98886555
- 1|44211100
- 0|99999877766666655555
- 0|4444333322222222222221111100000000000000000000000000
  0|1111112222222233344
  0|5666777888899
  1|1223333
  1|556
  2|0
```

Standardized Residuals

	pcr17X2	pcr19X4	pcr20X5	pcr21X6	hlrY2a	hlrY3a
pcr17X2	- -					
pcr19X4	0.285	- -				
pcr20X5	-0.666	-2.856	- -			
pcr21X6	-0.846	-2.872	-1.130	- -		
hlrY2a	-1.217	-0.566	2.281	2.344	- -	
hlrY3a	-0.560	-0.861	-0.505	-0.446	-1.168	- -
ak6Y19	-0.299	-1.243	0.459	0.529	-1.376	0.462
ak7Y20	0.636	1.005	1.067	1.866	-0.215	-0.411
ak9Y22	-0.908	0.169	0.043	1.234	-1.637	-1.152
ak10Y23	-0.073	0.826	0.274	0.096	-0.004	-0.886
ew11Y34	0.209	0.093	0.268	0.007	-1.847	-0.215
ew12Y35	0.019	1.220	-0.511	-0.036	-0.406	-0.993
ew24Y38	-0.215	-1.044	-2.517	-1.295	-0.423	-0.272
pa14Y25	-0.070	-0.062	1.173	1.396	-1.195	-2.355
pa15Y26	-0.288	1.863	0.936	2.268	1.110	-0.834
pa16Y27	0.236	0.137	2.018	1.423	-1.020	-0.236

Standardized Residuals (continued)

	ak6Y19	ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35
ak6Y19	- -					
ak7Y20	-0.397	- -				
ak9Y22	-3.943	-3.476	- -			
ak10Y23	-2.759	-1.772	-3.031	- -		
ew11Y34	-0.568	0.542	-0.288	0.329	- -	
ew12Y35	-0.814	-1.293	-1.972	0.379	-0.269	- -
ew24Y38	-1.039	-1.412	1.804	-0.691	0.008	-1.150
pa14Y25	-2.624	-2.438	0.397	0.973	-1.250	0.031
pa15Y26	-2.488	-1.558	0.423	1.384	-1.207	-0.754
pa16Y27	-1.143	-2.708	0.233	0.010	0.697	0.472

Standardized Residuals (continued)

	ew24Y38	pa14Y25	pa15Y26	pa16Y27
ew24Y38	- -			
pa14Y25	0.305	- -		
pa15Y26	-0.080	-0.737	- -	
pa16Y27	1.761	1.432	0.097	- -

Summary Statistics for Standardized Residuals

```
Smallest Standardized Residual =   -3.943
  Median Standardized Residual =   -0.049
 Largest Standardized Residual =    2.344
```

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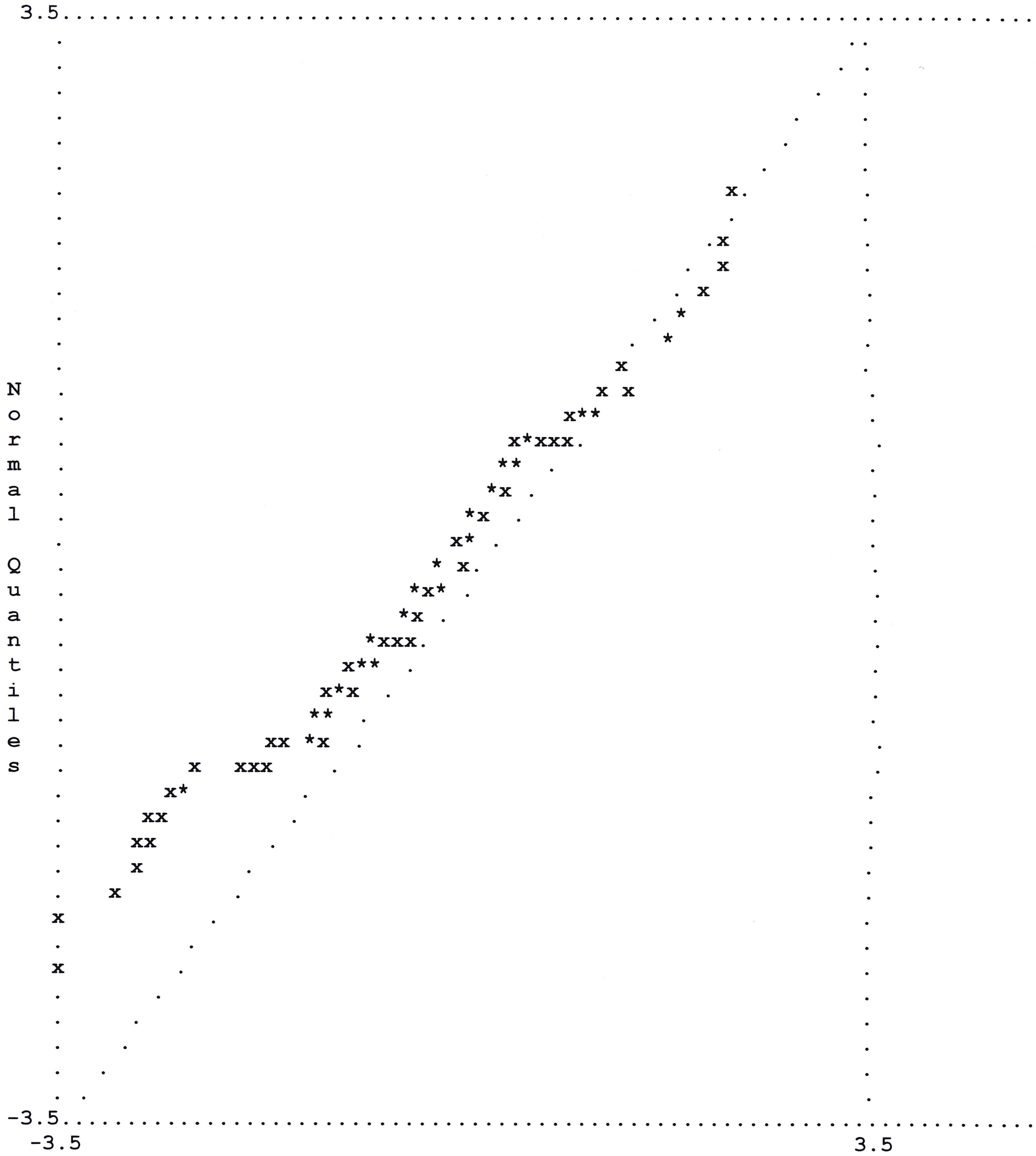
Stemleaf Plot

```
- 3|95
- 3|0
- 2|9987655
- 2|440
- 1|8866
- 1|443322222222110000
- 0|99988887776665 5
- 0|444443333322221111000000000000000000000000
  0|1111222233333444
  0|555556789
  1|00112224444
  1|8899
  2|0333
```

Largest Negative Standardized Residuals

Residual for	pcr20X5	and	pcr19X4	-2.856
Residual for	pcr21X6	and	pcr19X4	-2.872
Residual for	ak9Y22	and	ak6Y19	-3.943
Residual for	ak9Y22	and	ak7Y20	-3.476
Residual for	ak10Y23	and	ak6Y19	-2.759
Residual for	ak10Y23	and	ak9Y22	-3.031
Residual for	pa14Y25	and	ak6Y19	-2.624
Residual for	pa16Y27	and	ak7Y20	-2.708

Qplot of Standardized Residuals



Modification Indices and Expected Change

Modification Indices for LAMBDA-X

	PCRQ	HLR	AK	EW	PA
pcr17X2	- -	1.197	0.079	0.527	0.002
pcr19X4	- -	6.492	5.521	0.046	1.154
pcr20X5	- -	0.649	0.009	3.125	0.164
pcr21X6	- -	2.298	3.376	1.935	1.207
hlrY2a	0.630	- -	1.594	1.151	0.654
hlrY3a	0.630	- -	1.594	1.151	0.654
ak6Y19	0.000	0.000	- -	1.017	8.684
ak7Y20	1.093	1.649	- -	2.215	9.150
ak9Y22	0.000	0.043	- -	1.694	14.855
ak10Y23	1.149	0.790	- -	1.373	7.674
ew11Y34	1.681	1.918	0.008	- -	0.462
ew12Y35	0.145	0.003	0.364	- -	0.229
ew24Y38	2.663	2.098	0.234	- -	0.035
pa14Y25	3.898	1.544	0.289	0.367	- -
pa15Y26	2.119	3.697	3.271	0.062	- -
pa16Y27	2.115	1.703	3.476	3.564	- -

Expected Change for LAMBDA-X

	PCRQ	HLR	AK	EW	PA
pcr17X2	- -	-0.058	-0.015	0.040	-0.002
pcr19X4	- -	-0.151	-0.108	-0.014	-0.056
pcr20X5	- -	0.037	0.004	-0.075	-0.017
pcr21X6	- -	0.063	0.072	0.058	0.043
hlrY2a	0.060	- -	-0.192	0.177	-0.106
hlrY3a	-0.048	- -	0.151	-0.140	0.084
ak6Y19	-0.001	0.001	- -	-0.092	-0.363
ak7Y20	0.066	0.141	- -	-0.161	-0.374
ak9Y22	-0.001	-0.019	- -	0.119	0.496
ak10Y23	-0.065	-0.076	- -	0.114	0.361
ew11Y34	0.107	-0.156	0.008	- -	-0.088
ew12Y35	0.029	0.006	-0.066	- -	0.066
ew24Y38	-0.115	0.162	0.042	- -	0.022
pa14Y25	-0.110	-0.117	-0.107	-0.071	- -
pa15Y26	0.091	0.203	0.393	-0.032	- -
pa16Y27	0.102	-0.119	-0.254	0.229	- -

Standardized Expected Change for LAMBDA-X

	PCRQ	HLR	AK	EW	PA
pcr17X2	- -	-0.058	-0.015	0.040	-0.002
pcr19X4	- -	-0.151	-0.108	-0.014	-0.056
pcr20X5	- -	0.037	0.004	-0.075	-0.017
pcr21X6	- -	0.063	0.072	0.058	0.043
hlrY2a	0.060	- -	-0.192	0.177	-0.106
hlrY3a	-0.048	- -	0.151	-0.140	0.084
ak6Y19	-0.001	0.001	- -	-0.092	-0.363
ak7Y20	0.066	0.141	- -	-0.161	-0.374
ak9Y22	-0.001	-0.019	- -	0.119	0.496
ak10Y23	-0.065	-0.076	- -	0.114	0.361
ew11Y34	0.107	-0.156	0.008	- -	-0.088
ew12Y35	0.029	0.006	-0.066	- -	0.066
ew24Y38	-0.115	0.162	0.042	- -	0.022
pa14Y25	-0.110	-0.117	-0.107	-0.071	- -
pa15Y26	0.091	0.203	0.393	-0.032	- -
pa16Y27	0.102	-0.119	-0.254	0.229	- -

Completely Standardized Expected Change for LAMBDA-X

	PCRQ	HLR	AK	EW	PA
pcr17X2	- -	-0.058	-0.015	0.040	-0.002
pcr19X4	- -	-0.151	-0.108	-0.014	-0.056
pcr20X5	- -	0.037	0.004	-0.075	-0.017
pcr21X6	- -	0.063	0.072	0.058	0.043
hlrY2a	0.060	- -	-0.192	0.177	-0.106
hlrY3a	-0.048	- -	0.151	-0.140	0.084
ak6Y19	-0.001	0.001	- -	-0.092	-0.363
ak7Y20	0.066	0.141	- -	-0.161	-0.374
ak9Y22	-0.001	-0.019	- -	0.119	0.496
ak10Y23	-0.065	-0.076	- -	0.114	0.361
ew11Y34	0.107	-0.156	0.008	- -	-0.088
ew12Y35	0.029	0.006	-0.066	- -	0.066
ew24Y38	-0.115	0.162	0.042	- -	0.022
pa14Y25	-0.110	-0.117	-0.107	-0.071	- -
pa15Y26	0.091	0.203	0.393	-0.032	- -
pa16Y27	0.102	-0.119	-0.254	0.229	- -

No Non-Zero Modification Indices for PHI

Modification Indices for THETA-DELTA

	pcr17X2	pcr19X4	pcr20X5	pcr21X6	hlrY2a	hlrY3a
pcr17X2	- -					
pcr19X4	0.015	- -				
pcr20X5	0.224	0.310	- -			
pcr21X6	0.266	0.565	0.150	- -		
hlrY2a	4.364	3.543	3.348	1.033	- -	
hlrY3a	0.193	0.057	0.003	0.144	- -	- -
ak6Y19	2.153	5.296	0.567	0.000	2.716	5.939
ak7Y20	0.093	0.240	0.630	2.737	5.273	0.627
ak9Y22	3.657	0.001	0.228	0.633	0.123	0.083
ak10Y23	0.769	0.389	0.157	0.127	0.000	2.043
ew11Y34	0.319	0.675	0.072	1.687	3.994	0.002
ew12Y35	0.079	6.362	3.588	0.012	1.852	2.344
ew24Y38	3.450	0.374	7.523	0.004	3.100	0.009
pa14Y25	1.826	0.621	0.703	4.061	0.002	0.521
pa15Y26	1.361	5.568	1.353	0.471	0.072	1.958
pa16Y27	1.546	3.580	4.575	0.765	3.537	0.001

Modification Indices for THETA-DELTA (continued)

	ak6Y19	ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35
ak6Y19	- -					
ak7Y20	11.266	- -				
ak9Y22	0.005	0.168	- -			
ak10Y23	0.235	0.225	6.754	- -		
ew11Y34	0.295	2.024	0.433	4.237	- -	
ew12Y35	1.638	4.694	2.153	0.533	0.068	- -
ew24Y38	0.291	0.128	4.467	3.677	1.018	0.526
pa14Y25	4.071	2.590	5.035	0.638	1.611	3.602
pa15Y26	0.581	0.254	2.014	0.893	0.085	0.865
pa16Y27	0.384	9.732	0.614	2.611	0.093	1.490

Modification Indices for THETA-DELTA (continued)

	ew24Y38	pa14Y25	pa15Y26	pa16Y27
ew24Y38	- -			
pa14Y25	0.001	- -		
pa15Y26	1.495	0.738	- -	
pa16Y27	2.233	0.789	0.003	- -

Expected Change for THETA-DELTA

	pcr17X2	pcr19X4	pcr20X5	pcr21X6	hlrY2a	hlrY3a
pcr17X2	- -					
pcr19X4	-0.005	- -				
pcr20X5	-0.014	0.022	- -			
pcr21X6	0.016	-0.029	0.022	- -		
hlrY2a	-0.078	-0.080	0.061	0.031	- -	
hlrY3a	0.016	-0.009	0.002	-0.011	- -	- -
ak6Y19	0.071	-0.103	0.026	0.001	-0.085	0.127
ak7Y20	-0.019	-0.027	-0.035	0.062	0.146	-0.047
ak9Y22	-0.087	-0.002	0.022	0.027	-0.018	-0.016
ak10Y23	0.042	-0.032	-0.016	-0.013	0.000	-0.074
ew11Y34	0.030	-0.039	-0.012	0.051	-0.120	0.003
ew12Y35	0.014	0.134	-0.077	0.004	0.074	-0.088
ew24Y38	0.086	0.032	-0.104	0.003	0.096	-0.005
pa14Y25	0.060	-0.034	0.031	-0.063	0.002	-0.032
pa15Y26	-0.055	0.095	-0.044	0.022	0.013	0.077
pa16Y27	-0.062	-0.100	0.095	0.034	-0.105	-0.002

Expected Change for THETA-DELTA (continued)

	ak6Y19	ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35
ak6Y19	- -					
ak7Y20	0.307	- -				
ak9Y22	-0.004	-0.023	- -			
ak10Y23	0.028	0.031	-0.140	- -		
ew11Y34	-0.035	0.108	-0.042	0.133	- -	
ew12Y35	0.081	-0.159	-0.092	0.045	-0.027	- -
ew24Y38	-0.033	-0.024	0.129	-0.125	0.092	-0.071
pa14Y25	-0.096	-0.100	0.111	0.041	-0.075	0.119
pa15Y26	-0.039	-0.028	0.078	0.045	0.018	-0.060
pa16Y27	-0.033	-0.206	0.044	0.100	0.024	0.085

Expected Change for THETA-DELTA (continued)

	ew24Y38	pa14Y25	pa15Y26	pa16Y27
ew24Y38	- -			
pa14Y25	0.002	- -		
pa15Y26	-0.074	-0.133	- -	
pa16Y27	0.099	0.057	-0.004	- -

Completely Standardized Expected Change for THETA-DELTA

	pcr17X2	pcr19X4	pcr20X5	pcr21X6	hlrY2a	hlrY3a
pcr17X2	- -					
pcr19X4	-0.005	- -				
pcr20X5	-0.014	0.022	- -			
pcr21X6	0.016	-0.029	0.022	- -		
hlrY2a	-0.078	-0.080	0.061	0.031	- -	
hlrY3a	0.016	-0.009	0.002	-0.011	- -	- -
ak6Y19	0.071	-0.103	0.026	0.001	-0.085	0.127
ak7Y20	-0.019	-0.027	-0.035	0.062	0.146	-0.047
ak9Y22	-0.087	-0.002	0.022	0.027	-0.018	-0.016
ak10Y23	0.042	-0.032	-0.016	-0.013	0.000	-0.074
ew11Y34	0.030	-0.039	-0.012	0.051	-0.120	0.003
ew12Y35	0.014	0.134	-0.077	0.004	0.074	-0.088
ew24Y38	0.086	0.032	-0.104	0.003	0.096	-0.005
pa14Y25	0.060	-0.034	0.031	-0.063	0.002	-0.032
pa15Y26	-0.055	0.095	-0.044	0.022	0.013	0.077
pa16Y27	-0.062	-0.100	0.095	0.034	-0.105	-0.002

Completely Standardized Expected Change for THETA-DELTA (continued)

	ak6Y19	ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35
ak6Y19	- -					
ak7Y20	0.307	- -				
ak9Y22	-0.004	-0.023	- -			
ak10Y23	0.028	0.031	-0.140	- -		
ew11Y34	-0.035	0.108	-0.042	0.133	- -	
ew12Y35	0.081	-0.159	-0.092	0.045	-0.027	- -
ew24Y38	-0.033	-0.024	0.129	-0.125	0.092	-0.071
pa14Y25	-0.096	-0.100	0.111	0.041	-0.075	0.119
pa15Y26	-0.039	-0.028	0.078	0.045	0.018	-0.060
pa16Y27	-0.033	-0.206	0.044	0.100	0.024	0.085

Completely Standardized Expected Change for THETA-DELTA (continued)

	ew24Y38	pa14Y25	pa15Y26	pa16Y27
ew24Y38	- -			
pa14Y25	0.002	- -		
pa15Y26	-0.074	-0.133	- -	
pa16Y27	0.099	0.057	-0.004	- -

Maximum Modification Index is 14.86 for Element (9, 5) of LAMBDA-X

!HLR Model: LISREL Run 1

Standardized Solution

LAMBDA-X

	PCRQ	HLR	AK	EW	PA
pcr17X2	0.715	- -	- -	- -	- -
pcr19X4	0.876	- -	- -	- -	- -
pcr20X5	0.946	- -	- -	- -	- -
pcr21X6	0.988	- -	- -	- -	- -
hlrY2a	- -	0.646	- -	- -	- -
hlrY3a	- -	0.510	- -	- -	- -
ak6Y19	- -	- -	0.959	- -	- -
ak7Y20	- -	- -	0.809	- -	- -
ak9Y22	- -	- -	0.907	- -	- -
ak10Y23	- -	- -	0.730	- -	- -
ew11Y34	- -	- -	- -	0.542	- -
ew12Y35	- -	- -	- -	0.590	- -
ew24Y38	- -	- -	- -	0.494	- -
pa14Y25	- -	- -	- -	- -	0.813
pa15Y26	- -	- -	- -	- -	0.891
pa16Y27	- -	- -	- -	- -	0.381

PHI

	PCRQ	HLR	AK	EW	PA
PCRQ	1.000				
HLR	0.114	1.000			
AK	-0.187	0.448	1.000		
EW	0.132	0.409	0.416	1.000	
PA	-0.149	0.375	0.723	0.565	1.000

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Completely Standardized Solution

LAMBDA-X

	PCRQ	HLR	AK	EW	PA
pcr17X2	0.715	- -	- -	- -	- -
pcr19X4	0.876	- -	- -	- -	- -
pcr20X5	0.946	- -	- -	- -	- -
pcr21X6	0.988	- -	- -	- -	- -
hlrY2a	- -	0.646	- -	- -	- -
hlrY3a	- -	0.510	- -	- -	- -
ak6Y19	- -	- -	0.959	- -	- -
ak7Y20	- -	- -	0.809	- -	- -
ak9Y22	- -	- -	0.907	- -	- -
ak10Y23	- -	- -	0.730	- -	- -
ew11Y34	- -	- -	- -	0.542	- -
ew12Y35	- -	- -	- -	0.590	- -
ew24Y38	- -	- -	- -	0.494	- -
pa14Y25	- -	- -	- -	- -	0.813
pa15Y26	- -	- -	- -	- -	0.891
pa16Y27	- -	- -	- -	- -	0.381

PHI

	PCRQ	HLR	AK	EW	PA
PCRQ	1.000				
HLR	0.114	1.000			
AK	-0.187	0.448	1.000		
EW	0.132	0.409	0.416	1.000	
PA	-0.149	0.375	0.723	0.565	1.000

THETA-DELTA

pcr17X2	pcr19X4	pcr20X5	pcr21X6	hlrY2a	hlrY3a
0.489	0.232	0.106	0.024	0.582	0.740

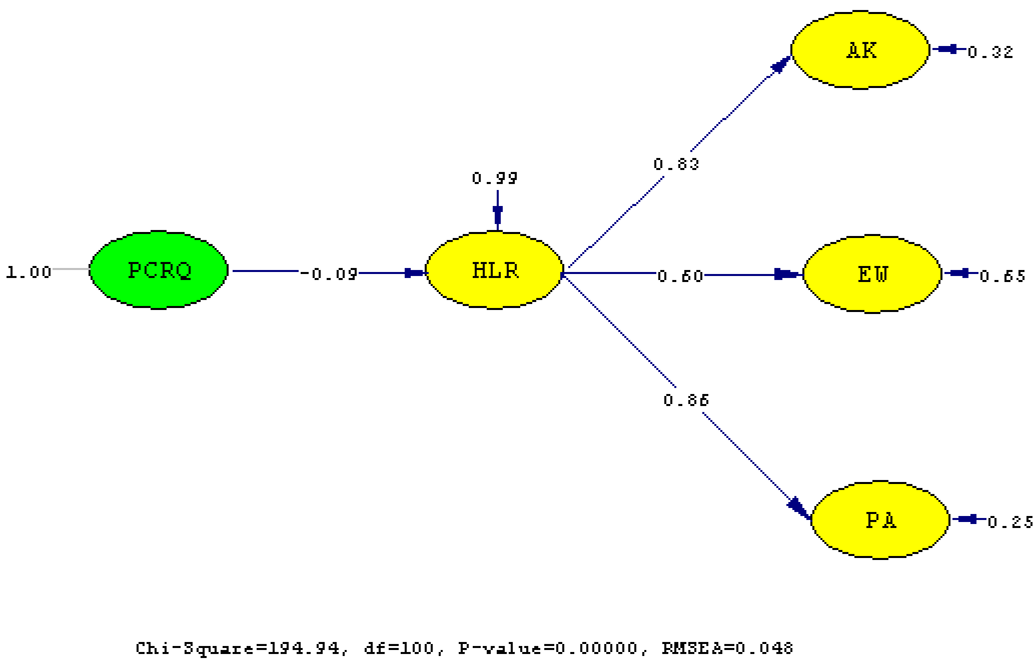
THETA-DELTA (continued)

ak6Y19	ak7Y20	ak9Y22	ak10Y23	ew11Y34	ew12Y35
0.081	0.346	0.178	0.467	0.706	0.652

THETA-DELTA (continued)

ew24Y38	pa14Y25	pa15Y26	pa16Y27
0.756	0.340	0.207	0.855

Time used: 0.328 Seconds



1.00
PCRQ
-0.09
0.99
HLR
0.83
0.60
0.86
AK
EW
PA
0.32
0.65
0.25
Chi-Square=194.94, df=100, P-value=0.00000, RMSEA=0.048

```
                    DATE:  3/18/2014
                     TIME: 16:49


                    L I S R E L  8.80

                          BY

               Karl G. Jöreskog and Dag Sörbom
```


The following lines were read from file **E:\9SEM1-HLR_1403\HLR_Model-SEM.LS8:**

```
!HLR_Model: LISREL Run 2
!Test Five-Factor HLR Mediation Structural Model: SEM Model M2(16-item)
 DA NI=16 NO=411 MA=PM
 LA
 pcr17X2 pcr19X4 pcr20X5 pcr21X6 hlrY2a hlrY3a ak6Y19 ak7Y20 ak9Y22 ak10Y23 ew11Y34 ew12Y35
ew24Y38 pa14Y25 pa15Y26 pa16Y27
 PM FI=HLR-Model.PM
 AC FI=HLR-Model.ACP
 SE
 5 6 7 8 9 10 11 12 13 14 15 16 1 2 3 4
 MO NY=12 NX=4 NE=4 NK=1 LY=FU,FI LX=FU,FI BE=FU,FI GA=FU,FI PH=SY,FR PS=DI,FR TE=DI,FR
TD=DI,FR
 FR LX 1 1 LX 2 1 LX 3 1 LX 4 1
 FR LY 1 1 LY 2 1
 FR LY 3 2 LY 4 2 LY 5 2 LY 6 2
 FR LY 7 3 LY 8 3 LY 9 3
 FR LY 10 4 LY 11 4 LY 12 4
 FR BE 2 1 BE 3 1 BE 4 1
 FR GA 1 1
 LE
 HLR AK EW PA
 LK
 PCRQ
 PD
 OU ME=WL ND=3 SC RS MI EF
```

!HLR_Model: LISREL Run 2

```
                    Number of Input Variables 16
                    Number of Y - Variables   12
                    Number of X - Variables    4
                    Number of ETA - Variables  4
                    Number of KSI - Variables  1
                    Number of Observations   411
```

Correlation Matrix

	hlrY2a	hlrY3a	ak6Y19	ak7Y20	ak9Y22	ak10Y23
hlrY2a	1.000					
hlrY3a	0.294	1.000				
ak6Y19	0.179	0.248	1.000			
ak7Y20	0.216	0.151	0.756	1.000		
ak9Y22	0.170	0.137	0.666	0.427	1.000	
ak10Y23	0.211	0.115	0.521	0.441	0.477	1.000
ew11Y34	0.030	0.100	0.162	0.242	0.180	0.192
ew12Y35	0.135	0.067	0.164	0.055	0.068	0.208
ew24Y38	0.108	0.088	0.104	0.010	0.316	0.095
pa14Y25	0.134	0.020	0.362	0.219	0.554	0.487
pa15Y26	0.271	0.120	0.426	0.367	0.605	0.549
pa16Y27	0.027	0.057	0.159	-0.084	0.268	0.202
pcr17X2	-0.009	0.014	-0.151	-0.039	-0.180	-0.103
pcr19X4	0.029	-0.005	-0.274	-0.006	-0.135	-0.047
pcr20X5	0.188	0.027	-0.126	-0.017	-0.157	-0.105
pcr21X6	0.196	0.033	-0.135	0.055	-0.083	-0.128

Correlation Matrix (continued)

	ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26	pa16Y27
ew11Y34	1.000					
ew12Y35	0.304	1.000				
ew24Y38	0.268	0.231	1.000			
pa14Y25	0.156	0.273	0.246	1.000		
pa15Y26	0.180	0.246	0.243	0.700	1.000	
pa16Y27	0.176	0.163	0.236	0.393	0.346	1.000
pcr17X2	0.066	0.057	0.033	-0.091	-0.114	-0.024
pcr19X4	0.071	0.158	-0.023	-0.111	0.038	-0.038
pcr20X5	0.090	0.037	-0.120	-0.032	-0.057	0.111
pcr21X6	0.071	0.075	-0.025	-0.029	0.019	0.053

Correlation Matrix (continued)

	pcr17X2	pcr19X4	pcr20X5	pcr21X6
pcr17X2	1.000			
pcr19X4	0.637	1.000		
pcr20X5	0.646	0.728	1.000	
pcr21X6	0.669	0.759	0.920	1.000

!HLR_Model: LISREL Run 2

Parameter Specifications

LAMBDA-Y

	HLR	AK	EW	PA
hlrY2a	0	0	0	0
hlrY3a	1	0	0	0
ak6Y19	0	0	0	0
ak7Y20	0	2	0	0
ak9Y22	0	3	0	0
ak10Y23	0	4	0	0
ew11Y34	0	0	0	0
ew12Y35	0	0	5	0
ew24Y38	0	0	6	0
pa14Y25	0	0	0	0
pa15Y26	0	0	0	7
pa16Y27	0	0	0	8

LAMBDA-X

	PCRQ
pcr17X2	9
pcr19X4	10
pcr20X5	11
pcr21X6	12

BETA

	HLR	AK	EW	PA
HLR	0	0	0	0
AK	13	0	0	0
EW	14	0	0	0
PA	15	0	0	0

GAMMA

	PCRQ
HLR	16
AK	0
EW	0
PA	0

PSI

HLR	AK	EW	PA
17	18	19	20

THETA-EPS

hlrY2a	hlrY3a	ak6Y19	ak7Y20	ak9Y22	ak10Y23
21	22	23	24	25	26

THETA-EPS (continued)

ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26	pa16Y27
27	28	29	30	31	32

THETA-DELTA

pcr17X2	pcr19X4	pcr20X5	pcr21X6
33	34	35	36

!HLR_Model: LISREL Run 2

Number of Iterations = 29

LISREL Estimates (Weighted Least Squares)

LAMBDA-Y

	HLR	AK	EW	PA
hlrY2a	0.439	- -	- -	- -
hlrY3a	0.366 (0.054) 6.728	- -	- -	- -
ak6Y19	- -	0.976	- -	- -
ak7Y20	- -	0.848 (0.069) 12.216	- -	- -
ak9Y22	- -	0.895 (0.052) 17.240	- -	- -
ak10Y23	- -	0.716 (0.051) 13.940	- -	- -
ew11Y34	- -	- -	0.475	- -
ew12Y35	- -	- -	0.525 (0.126) 4.173	- -
ew24Y38	- -	- -	0.510 (0.113) 4.505	- -
pa14Y25	- -	- -	- -	0.814
pa15Y26	- -	- -	- -	0.867 (0.069) 12.575
pa16Y27	- -	- -	- -	0.368 (0.060) 6.089

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LAMBDA-X

	PCRQ
pcr17X2	0.686
	(0.034)
	20.472
pcr19X4	0.872
	(0.028)
	31.045
pcr20X5	0.941
	(0.015)
	61.556
pcr21X6	0.987
	(0.014)
	68.817

BETA

	HLR	AK	EW	PA
HLR	- -	- -	- -	- -
AK	0.826	- -	- -	- -
	(0.103)			
	7.987			
EW	0.596	- -	- -	- -
	(0.138)			
	4.305			
PA	0.864	- -	- -	- -
	(0.108)			
	7.977			

GAMMA

	PCRQ
HLR	-0.094
	(0.050)
	-1.903
AK	- -
EW	- -
PA	- -

Covariance Matrix of ETA and KSI

	HLR	AK	EW	PA	PCRQ
HLR	1.000				
AK	0.826	1.000			
EW	0.596	0.492	1.000		
PA	0.864	0.714	0.515	1.000	
PCRQ	-0.094	-0.078	-0.056	-0.082	1.000

PHI

PCRQ
1.000

PSI

Note: This matrix is diagonal.

HLR	AK	EW	PA
0.991	0.318	0.645	0.253
(0.206)	(0.082)	(0.255)	(0.087)
4.822	3.872	2.535	2.924

Squared Multiple Correlations for Structural Equations

HLR	AK	EW	PA
0.009	0.682	0.355	0.747

Squared Multiple Correlations for Reduced Form

HLR	AK	EW	PA
0.009	0.006	0.003	0.007

Reduced Form

	PCRQ
HLR	-0.094
	(0.050)
	-1.903
AK	-0.078
	(0.041)
	-1.925
EW	-0.056
	(0.033)
	-1.725
PA	-0.082
	(0.043)
	-1.891

THETA-EPS

hlrY2a	hlrY3a	ak6Y19	ak7Y20	ak9Y22	ak10Y23
0.808	0.866	0.048	0.282	0.199	0.487
(0.063)	(0.059)	(0.080)	(0.102)	(0.083)	(0.081)
12.729	14.738	0.601	2.764	2.385	6.012

THETA-EPS (continued)

ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26	pa16Y27
0.774	0.724	0.740	0.337	0.248	0.865
(0.091)	(0.096)	(0.093)	(0.088)	(0.085)	(0.065)
8.505	7.517	7.975	3.825	2.935	13.231

Squared Multiple Correlations for Y - Variables

hlrY2a	hlrY3a	ak6Y19	ak7Y20	ak9Y22	ak10Y23
0.192	0.134	0.952	0.718	0.801	0.513

Squared Multiple Correlations for Y - Variables (continued)

ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26	pa16Y27
0.226	0.276	0.260	0.663	0.752	0.135

THETA-DELTA

pcr17X2	pcr19X4	pcr20X5	pcr21X6
0.529	0.240	0.115	0.025
(0.067)	(0.070)	(0.057)	(0.057)
7.848	3.446	2.005	0.437

Squared Multiple Correlations for X - Variables

pcr17X2	pcr19X4	pcr20X5	pcr21X6
0.471	0.760	0.885	0.975

Goodness of Fit Statistics

```
Degrees of Freedom = 100
Minimum Fit Function Chi-Square = 194.943 (P = 0.000)
Estimated Non-centrality Parameter (NCP) = 94.943
90 Percent Confidence Interval for NCP = (59.180 ; 138.503)

Minimum Fit Function Value = 0.475
Population Discrepancy Function Value (F0) = 0.232
90 Percent Confidence Interval for F0 = (0.144 ; 0.338)
Root Mean Square Error of Approximation (RMSEA) = 0.0481
90 Percent Confidence Interval for RMSEA = (0.0380 ; 0.0581)
P-Value for Test of Close Fit (RMSEA < 0.05) = 0.608

Expected Cross-Validation Index (ECVI) = 0.651
90 Percent Confidence Interval for ECVI = (0.564 ; 0.757)
ECVI for Saturated Model = 0.663
ECVI for Independence Model = 15.030

Chi-Square for Independence Model with 120 Degrees of Freedom = 6130.471
Independence AIC = 6162.471
Model AIC = 266.943
Saturated AIC = 272.000
Independence CAIC = 6242.769
Model CAIC = 447.612
Saturated CAIC = 954.529

Normed Fit Index (NFI) = 0.968
Non-Normed Fit Index (NNFI) = 0.981
Parsimony Normed Fit Index (PNFI) = 0.807
Comparative Fit Index (CFI) = 0.984
Incremental Fit Index (IFI) = 0.984
Relative Fit Index (RFI) = 0.962

Critical N (CN) = 286.636


Root Mean Square Residual (RMR) = 0.103
Standardized RMR = 0.103
Goodness of Fit Index (GFI) = 0.985
Adjusted Goodness of Fit Index (AGFI) = 0.979
Parsimony Goodness of Fit Index (PGFI) = 0.724
```

Fitted Covariance Matrix

	hlrY2a	hlrY3a	ak6Y19	ak7Y20	ak9Y22	ak10Y23
hlrY2a	1.000					
hlrY3a	0.160	1.000				
ak6Y19	0.353	0.295	1.000			
ak7Y20	0.307	0.256	0.827	1.000		
ak9Y22	0.324	0.270	0.873	0.759	1.000	
ak10Y23	0.259	0.216	0.699	0.607	0.641	1.000
ew11Y34	0.124	0.103	0.228	0.198	0.209	0.167
ew12Y35	0.137	0.114	0.252	0.219	0.231	0.185
ew24Y38	0.133	0.111	0.245	0.213	0.225	0.180
pa14Y25	0.309	0.257	0.567	0.493	0.520	0.416
pa15Y26	0.329	0.274	0.604	0.525	0.554	0.443
pa16Y27	0.139	0.116	0.256	0.223	0.235	0.188
pcr17X2	-0.028	-0.024	-0.052	-0.045	-0.048	-0.038
pcr19X4	-0.036	-0.030	-0.066	-0.058	-0.061	-0.049
pcr20X5	-0.039	-0.032	-0.072	-0.062	-0.066	-0.053
pcr21X6	-0.041	-0.034	-0.075	-0.065	-0.069	-0.055

Fitted Covariance Matrix (continued)

	ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26	pa16Y27
ew11Y34	1.000					
ew12Y35	0.249	1.000				
ew24Y38	0.242	0.268	1.000			
pa14Y25	0.199	0.220	0.214	1.000		
pa15Y26	0.212	0.234	0.228	0.706	1.000	
pa16Y27	0.090	0.099	0.097	0.300	0.319	1.000
pcr17X2	-0.018	-0.020	-0.020	-0.046	-0.049	-0.021
pcr19X4	-0.023	-0.026	-0.025	-0.058	-0.062	-0.026
pcr20X5	-0.025	-0.028	-0.027	-0.063	-0.067	-0.028
pcr21X6	-0.026	-0.029	-0.028	-0.066	-0.070	-0.030

Fitted Covariance Matrix (continued)

	pcr17X2	pcr19X4	pcr20X5	pcr21X6
pcr17X2	1.000			
pcr19X4	0.598	1.000		
pcr20X5	0.645	0.820	1.000	
pcr21X6	0.677	0.861	0.929	1.000

Fitted Residuals

	hlrY2a	hlrY3a	ak6Y19	ak7Y20	ak9Y22	ak10Y23
hlrY2a	0.000					
hlrY3a	0.134	0.000				
ak6Y19	-0.175	-0.046	0.000			
ak7Y20	-0.091	-0.105	-0.071	0.000		
ak9Y22	-0.154	-0.133	-0.208	-0.332	0.000	
ak10Y23	-0.048	-0.102	-0.178	-0.166	-0.164	0.000
ew11Y34	-0.094	-0.004	-0.066	0.044	-0.029	0.025
ew12Y35	-0.002	-0.047	-0.088	-0.163	-0.163	0.023

ew24Y38	-0.026	-0.023	-0.140	-0.202	0.091	-0.084
pa14Y25	-0.174	-0.237	-0.205	-0.273	0.033	0.070
pa15Y26	-0.058	-0.154	-0.177	-0.157	0.051	0.105
pa16Y27	-0.113	-0.059	-0.097	-0.306	0.033	0.014
pcr17X2	0.020	0.038	-0.099	0.006	-0.132	-0.065
pcr19X4	0.065	0.026	-0.208	0.052	-0.074	0.002
pcr20X5	0.227	0.059	-0.055	0.045	-0.091	-0.053
pcr21X6	0.237	0.067	-0.060	0.121	-0.014	-0.073

Fitted Residuals (continued)

	ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26	pa16Y27
ew11Y34	0.000					
ew12Y35	0.055	0.000				
ew24Y38	0.026	-0.037	0.000			
pa14Y25	-0.043	0.053	0.033	0.000		
pa15Y26	-0.032	0.011	0.015	-0.007	0.000	
pa16Y27	0.086	0.064	0.139	0.093	0.027	0.000
pcr17X2	0.085	0.077	0.053	-0.045	-0.065	-0.004
pcr19X4	0.094	0.183	0.002	-0.053	0.100	-0.012
pcr20X5	0.115	0.065	-0.093	0.031	0.010	0.139
pcr21X6	0.098	0.104	0.004	0.036	0.089	0.083

Fitted Residuals (continued)

	pcr17X2	pcr19X4	pcr20X5	pcr21X6
pcr17X2	0.000			
pcr19X4	0.039	0.000		
pcr20X5	0.001	-0.093	0.000	
pcr21X6	-0.009	-0.102	-0.009	0.000

Summary Statistics for Fitted Residuals

```
Smallest Fitted Residual =   -0.332
  Median Fitted Residual =    0.000
 Largest Fitted Residual =    0.237
```

Stemleaf Plot

```
- 3|31
- 2|7
- 2|41100
- 1|88777666655
- 1|433100000
- 0|99999987777766665555555
- 0|44333211111000000000000000000000
  0|1111222233333334444
  0|55555566777788899999
  1|000112344
  1|8
  2|34
```

9

Standardized Residuals

	hlrY2a	hlrY3a	ak6Y19	ak7Y20	ak9Y22	ak10Y23
hlrY2a	- -					
hlrY3a	2.932	- -				
ak6Y19	-2.304	-0.693	- -			
ak7Y20	-1.059	-1.282	-1.415	- -		
ak9Y22	-2.532	-2.103	-3.930	-3.723	- -	
ak10Y23	-0.786	-1.686	-2.706	-1.955	-2.627	- -
ew11Y34	-1.387	-0.055	-0.702	0.403	-0.348	0.296
ew12Y35	-0.030	-0.762	-1.009	-1.479	-2.060	0.300
ew24Y38	-0.429	-0.392	-1.594	-1.853	1.282	-1.073
pa14Y25	-3.134	-4.030	-2.635	-2.604	0.624	1.173
pa15Y26	-1.076	-2.463	-2.262	-1.580	0.979	1.784
pa16Y27	-1.781	-0.900	-1.043	-2.702	0.412	0.169
pcr17X2	0.335	0.690	-1.246	0.055	-1.921	-0.875
pcr19X4	0.900	0.362	-2.129	0.404	-0.855	0.022
pcr20X5	3.507	0.920	-0.554	0.374	-1.078	-0.586
pcr21X6	3.584	1.067	-0.702	1.074	-0.188	-0.918

Standardized Residuals (continued)

	ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26	pa16Y27
ew11Y34	- -					
ew12Y35	0.868	- -				
ew24Y38	0.421	-0.699	- -			
pa14Y25	-0.555	0.776	0.488	- -		
pa15Y26	-0.394	0.158	0.209	-0.199	- -	
pa16Y27	0.990	0.812	1.876	1.573	0.387	- -
pcr17X2	1.087	1.101	0.768	-0.681	-0.900	-0.050
pcr19X4	1.030	2.225	0.023	-0.639	1.115	-0.138
pcr20X5	1.272	0.795	-1.168	0.396	0.122	1.667
pcr21X6	1.135	1.331	0.049	0.499	1.164	1.050

Standardized Residuals (continued)

	pcr17X2	pcr19X4	pcr20X5	pcr21X6
pcr17X2	- -			
pcr19X4	1.053	- -		
pcr20X5	0.018	-2.585	- -	
pcr21X6	-0.197	-2.779	-0.725	- -

Summary Statistics for Standardized Residuals

```
Smallest Standardized Residual =  -4.030
  Median Standardized Residual =   0.000
 Largest Standardized Residual =   3.584
```

Stemleaf Plot

```
- 4|0
- 3|97
- 3|1
- 2|877666655
- 2|331110
- 1|9987665
- 1|44322111100
- 0|99999887777776666
- 0|4443222111000000000000000000000
  0|1122233344444444
  0|55678888999
  1|0001111111122333
  1|6789
  2|2
  2|9
  3|
  3|56
```

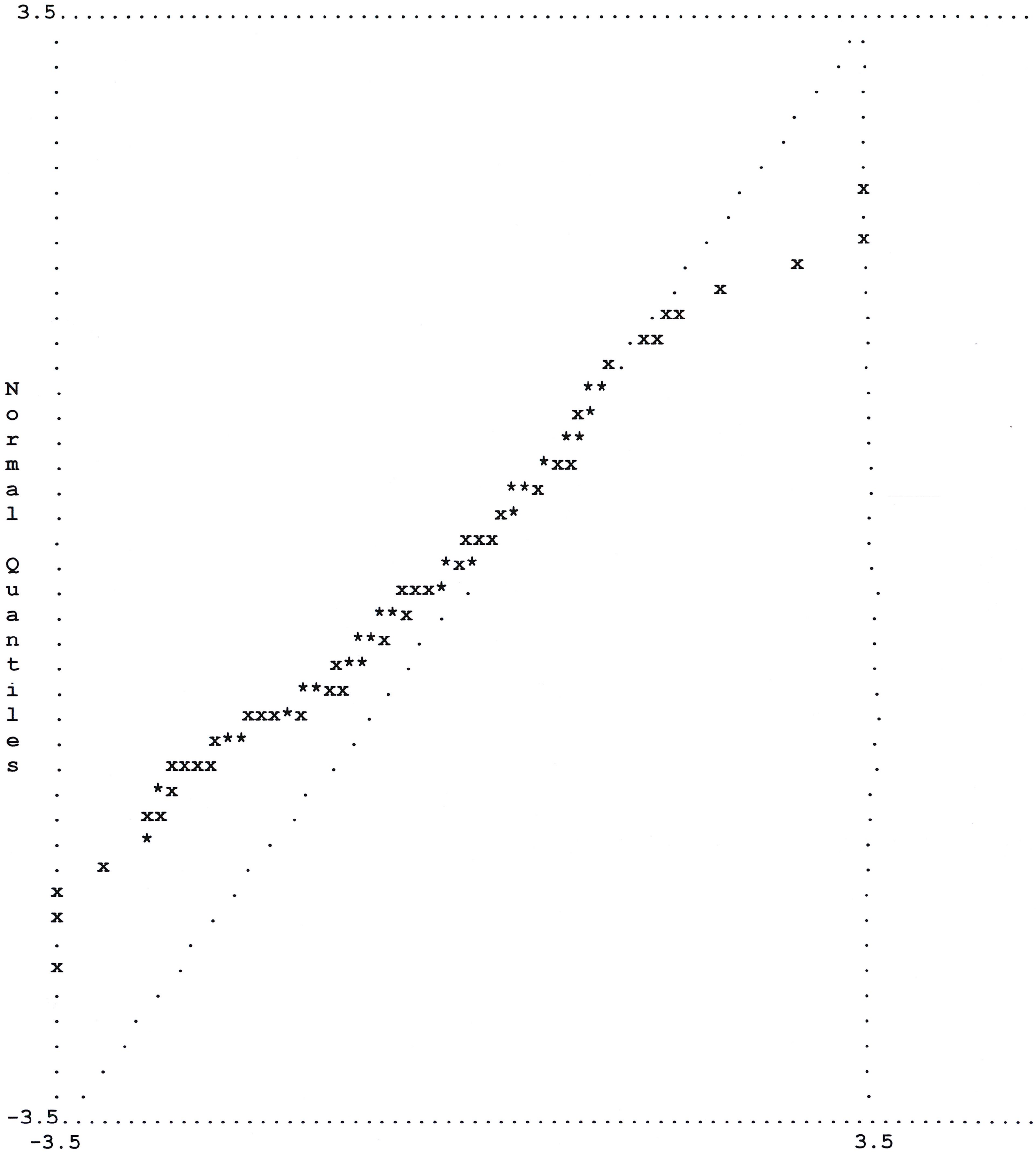
Largest Negative Standardized Residuals

Residual for	ak9Y22	and	ak6Y19	-3.930
Residual for	ak9Y22	and	ak7Y20	-3.723
Residual for	ak10Y23	and	ak6Y19	-2.706
Residual for	ak10Y23	and	ak9Y22	-2.627
Residual for	pa14Y25	and	hlrY2a	-3.134
Residual for	pa14Y25	and	hlrY3a	-4.030
Residual for	pa14Y25	and	ak6Y19	-2.635
Residual for	pa14Y25	and	ak7Y20	-2.604
Residual for	pa16Y27	and	ak7Y20	-2.702
Residual for	pcr20X5	and	pcr19X4	-2.585
Residual for	pcr21X6	and	pcr19X4	-2.779

Largest Positive Standardized Residuals

Residual for	hlrY3a	and	hlrY2a	2.932
Residual for	pcr20X5	and	hlrY2a	3.507
Residual for	pcr21X6	and	hlrY2a	3.584

Qplot of Standardized Residuals



Modification Indices and Expected Change

Modification Indices for LAMBDA-Y

	HLR	AK	EW	PA
hlrY2a	- -	0.069	3.169	5.137
hlrY3a	- -	0.483	1.467	1.125
ak6Y19	3.231	- -	0.374	5.348
ak7Y20	7.290	- -	4.425	7.064
ak9Y22	6.734	- -	0.054	10.805
ak10Y23	4.626	- -	0.348	7.394
ew11Y34	0.926	0.127	- -	0.521
ew12Y35	0.363	0.913	- -	2.513
ew24Y38	0.137	0.100	- -	0.155
pa14Y25	0.136	0.896	1.080	- -
pa15Y26	0.603	0.947	0.011	- -
pa16Y27	1.248	0.935	3.383	- -

Expected Change for LAMBDA-Y

	HLR	AK	EW	PA
hlrY2a	- -	-0.042	0.207	-0.472
hlrY3a	- -	-0.114	-0.134	-0.224
ak6Y19	-0.328	- -	-0.066	-0.273
ak7Y20	-0.559	- -	-0.280	-0.346
ak9Y22	0.458	- -	0.026	0.381
ak10Y23	0.441	- -	0.069	0.340
ew11Y34	-0.155	-0.042	- -	-0.098
ew12Y35	0.109	-0.125	- -	0.232
ew24Y38	0.064	-0.037	- -	0.056
pa14Y25	0.228	0.180	0.126	- -
pa15Y26	0.501	0.188	-0.011	- -
pa16Y27	-0.300	-0.130	0.229	- -

Standardized Expected Change for LAMBDA-Y

	HLR	AK	EW	PA
hlrY2a	- -	-0.042	0.207	-0.472
hlrY3a	- -	-0.114	-0.134	-0.224
ak6Y19	-0.328	- -	-0.066	-0.273
ak7Y20	-0.559	- -	-0.280	-0.346
ak9Y22	0.458	- -	0.026	0.381
ak10Y23	0.441	- -	0.069	0.340
ew11Y34	-0.155	-0.042	- -	-0.098
ew12Y35	0.109	-0.125	- -	0.232
ew24Y38	0.064	-0.037	- -	0.056
pa14Y25	0.228	0.180	0.126	- -
pa15Y26	0.501	0.188	-0.011	- -
pa16Y27	-0.300	-0.130	0.229	- -

Completely Standardized Expected Change for LAMBDA-Y

	HLR	AK	EW	PA
hlrY2a	- -	-0.042	0.207	-0.472
hlrY3a	- -	-0.114	-0.134	-0.224
ak6Y19	-0.328	- -	-0.066	-0.273
ak7Y20	-0.559	- -	-0.280	-0.346
ak9Y22	0.458	- -	0.026	0.381
ak10Y23	0.441	- -	0.069	0.340
ew11Y34	-0.155	-0.042	- -	-0.098
ew12Y35	0.109	-0.125	- -	0.232
ew24Y38	0.064	-0.037	- -	0.056
pa14Y25	0.228	0.180	0.126	- -
pa15Y26	0.501	0.188	-0.011	- -
pa16Y27	-0.300	-0.130	0.229	- -

No Non-Zero Modification Indices for LAMBDA-X

Modification Indices for BETA

	HLR	AK	EW	PA
HLR	- -	4.791	5.212	0.069
AK	- -	- -	3.456	7.382
EW	- -	3.456	- -	3.238
PA	- -	7.382	3.238	- -

Expected Change for BETA

	HLR	AK	EW	PA
HLR	- -	-3.916	3.152	-0.619
AK	- -	- -	-0.257	1.610
EW	- -	-0.522	- -	0.710
PA	- -	1.282	0.278	- -

Standardized Expected Change for BETA

	HLR	AK	EW	PA
HLR	- -	-3.916	3.152	-0.619
AK	- -	- -	-0.257	1.610
EW	- -	-0.522	- -	0.710
PA	- -	1.282	0.278	- -

Modification Indices for GAMMA

	PCRQ
HLR	- -
AK	4.792
EW	5.212
PA	0.069

Expected Change for GAMMA

	PCRQ
HLR	- -
AK	-0.119
EW	0.194
PA	-0.015

Standardized Expected Change for GAMMA

	PCRQ
HLR	- -
AK	-0.119
EW	0.194
PA	-0.015

No Non-Zero Modification Indices for PHI

Modification Indices for PSI

	HLR	AK	EW	PA
HLR	- -			
AK	4.791	- -		
EW	5.212	3.456	- -	
PA	0.069	7.382	3.238	- -

Expected Change for PSI

	HLR	AK	EW	PA
HLR	- -			
AK	-1.245	- -		
EW	2.034	-0.166	- -	
PA	-0.157	0.408	0.180	- -

Standardized Expected Change for PSI

	HLR	AK	EW	PA
HLR	- -			
AK	-1.245	- -		
EW	2.034	-0.166	- -	
PA	-0.157	0.408	0.180	- -

Modification Indices for THETA-EPS

	hlrY2a	hlrY3a	ak6Y19	ak7Y20	ak9Y22	ak10Y23
hlrY2a	- -					
hlrY3a	20.549	- -				
ak6Y19	1.537	4.897	- -			
ak7Y20	1.052	1.946	11.632	- -		
ak9Y22	0.017	0.214	0.164	0.098	- -	
ak10Y23	0.030	3.681	0.011	0.118	3.792	- -
ew11Y34	2.840	0.108	0.421	1.057	0.947	2.652
ew12Y35	3.334	1.755	0.680	5.148	2.861	0.285
ew24Y38	3.800	0.531	0.048	0.110	1.874	5.350
pa14Y25	0.878	1.784	0.746	2.744	4.747	1.168
pa15Y26	0.292	0.153	2.324	0.071	1.623	1.299
pa16Y27	6.334	0.037	0.074	10.650	0.569	3.974

Modification Indices for THETA-EPS (continued)

	ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26	pa16Y27
ew11Y34	- -					
ew12Y35	0.137	- -				
ew24Y38	0.363	0.926	- -			
pa14Y25	1.042	3.481	0.304	- -		
pa15Y26	0.491	0.020	0.562	1.248	- -	
pa16Y27	0.510	2.414	1.841	0.603	0.136	- -

Expected Change for THETA-EPS

	hlrY2a	hlrY3a	ak6Y19	ak7Y20	ak9Y22	ak10Y23
hlrY2a	- -					
hlrY3a	0.236	- -				
ak6Y19	-0.062	0.115	- -			
ak7Y20	0.063	-0.083	0.323	- -		
ak9Y22	0.006	-0.025	-0.024	-0.018	- -	
ak10Y23	0.009	-0.096	0.006	0.023	-0.102	- -
ew11Y34	-0.096	0.019	-0.041	0.078	-0.062	0.104
ew12Y35	0.092	-0.073	0.051	-0.165	-0.105	0.032
ew24Y38	0.103	-0.038	-0.014	-0.022	0.085	-0.146
pa14Y25	-0.044	-0.059	-0.040	-0.102	0.107	0.055
pa15Y26	-0.025	0.022	-0.075	0.015	0.067	0.054
pa16Y27	-0.140	-0.011	-0.014	-0.214	0.042	0.122

Expected Change for THETA-EPS (continued)

	ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26	pa16Y27
ew11Y34	- -					
ew12Y35	0.034	- -				
ew24Y38	0.055	-0.094	- -			
pa14Y25	-0.059	0.112	0.032	- -		
pa15Y26	0.041	-0.008	-0.041	-0.169	- -	
pa16Y27	0.054	0.108	0.089	0.051	0.026	- -

Completely Standardized Expected Change for THETA-EPS

	hlrY2a	hlrY3a	ak6Y19	ak7Y20	ak9Y22	ak10Y23
hlrY2a	- -					
hlrY3a	0.236	- -				
ak6Y19	-0.062	0.115	- -			
ak7Y20	0.063	-0.083	0.323	- -		
ak9Y22	0.006	-0.025	-0.024	-0.018	- -	
ak10Y23	0.009	-0.096	0.006	0.023	-0.102	- -
ew11Y34	-0.096	0.019	-0.041	0.078	-0.062	0.104
ew12Y35	0.092	-0.073	0.051	-0.165	-0.105	0.032
ew24Y38	0.103	-0.038	-0.014	-0.022	0.085	-0.146
pa14Y25	-0.044	-0.059	-0.040	-0.102	0.107	0.055
pa15Y26	-0.025	0.022	-0.075	0.015	0.067	0.054
pa16Y27	-0.140	-0.011	-0.014	-0.214	0.042	0.122

Completely Standardized Expected Change for THETA-EPS (continued)

	ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26	pa16Y27
ew11Y34	- -					
ew12Y35	0.034	- -				
ew24Y38	0.055	-0.094	- -			
pa14Y25	-0.059	0.112	0.032	- -		
pa15Y26	0.041	-0.008	-0.041	-0.169	- -	
pa16Y27	0.054	0.108	0.089	0.051	0.026	- -

Modification Indices for THETA-DELTA-EPS

	hlrY2a	hlrY3a	ak6Y19	ak7Y20	ak9Y22	ak10Y23
pcr17X2	4.626	0.610	1.168	0.116	3.172	0.318
pcr19X4	2.675	0.243	5.598	0.274	0.006	0.344
pcr20X5	8.615	0.004	0.027	0.055	0.251	0.012
pcr21X6	1.177	0.674	0.023	1.379	0.041	1.094

Modification Indices for THETA-DELTA-EPS (continued)

	ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26	pa16Y27
pcr17X2	0.155	1.398	5.323	1.291	1.882	1.893
pcr19X4	1.274	9.885	0.619	0.362	2.795	4.272
pcr20X5	0.242	5.767	11.332	1.920	3.158	3.480
pcr21X6	4.972	0.450	0.909	4.903	2.105	1.334

Expected Change for THETA-DELTA-EPS

	hlrY2a	hlrY3a	ak6Y19	ak7Y20	ak9Y22	ak10Y23
pcr17X2	-0.080	0.028	0.051	-0.021	-0.080	0.026
pcr19X4	-0.071	0.019	-0.105	-0.029	0.004	-0.030
pcr20X5	0.094	0.002	0.006	-0.010	0.022	-0.004
pcr21X6	0.033	-0.024	0.004	0.043	0.007	-0.037

Expected Change for THETA-DELTA-EPS (continued)

	ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26	pa16Y27
pcr17X2	0.020	0.057	0.104	0.049	-0.064	-0.068
pcr19X4	-0.054	0.163	0.041	-0.025	0.066	-0.108
pcr20X5	-0.021	-0.095	-0.127	0.051	-0.067	0.082
pcr21X6	0.083	0.024	0.035	-0.066	0.045	0.045

Completely Standardized Expected Change for THETA-DELTA-EPS

	hlrY2a	hlrY3a	ak6Y19	ak7Y20	ak9Y22	ak10Y23
pcr17X2	-0.080	0.028	0.051	-0.021	-0.080	0.026
pcr19X4	-0.071	0.019	-0.105	-0.029	0.004	-0.030
pcr20X5	0.094	0.002	0.006	-0.010	0.022	-0.004
pcr21X6	0.033	-0.024	0.004	0.043	0.007	-0.037

Completely Standardized Expected Change for THETA-DELTA-EPS (continued)

	ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26	pa16Y27
pcr17X2	0.020	0.057	0.104	0.049	-0.064	-0.068
pcr19X4	-0.054	0.163	0.041	-0.025	0.066	-0.108
pcr20X5	-0.021	-0.095	-0.127	0.051	-0.067	0.082
pcr21X6	0.083	0.024	0.035	-0.066	0.045	0.045

Modification Indices for THETA-DELTA

	pcr17X2	pcr19X4	pcr20X5	pcr21X6
pcr17X2	- -			
pcr19X4	0.088	- -		
pcr20X5	0.027	0.055	- -	
pcr21X6	0.008	0.021	0.328	- -

Expected Change for THETA-DELTA

	pcr17X2	pcr19X4	pcr20X5	pcr21X6
pcr17X2	- -			
pcr19X4	0.011	- -		
pcr20X5	-0.005	-0.009	- -	
pcr21X6	-0.003	-0.006	0.034	- -

Completely Standardized Expected Change for THETA-DELTA

	pcr17X2	pcr19X4	pcr20X5	pcr21X6
pcr17X2	- -			
pcr19X4	0.011	- -		
pcr20X5	-0.005	-0.009	- -	
pcr21X6	-0.003	-0.006	0.034	- -

Maximum Modification Index is 20.55 for Element (2, 1) of THETA-EPS

Standardized Solution

LAMBDA-Y

	HLR	AK	EW	PA
hlrY2a	0.439	- -	- -	- -
hlrY3a	0.366	- -	- -	- -
ak6Y19	- -	0.976	- -	- -
ak7Y20	- -	0.848	- -	- -
ak9Y22	- -	0.895	- -	- -
ak10Y23	- -	0.716	- -	- -
ew11Y34	- -	- -	0.475	- -
ew12Y35	- -	- -	0.525	- -
ew24Y38	- -	- -	0.510	- -
pa14Y25	- -	- -	- -	0.814
pa15Y26	- -	- -	- -	0.867
pa16Y27	- -	- -	- -	0.368

LAMBDA-X

	PCRQ
pcr17X2	0.686
pcr19X4	0.872
pcr20X5	0.941
pcr21X6	0.987

BETA

	HLR	AK	EW	PA
HLR	- -	- -	- -	- -
AK	0.826	- -	- -	- -
EW	0.596	- -	- -	- -
PA	0.864	- -	- -	- -

GAMMA

	PCRQ
HLR	-0.094
AK	- -
EW	- -
PA	- -

Correlation Matrix of ETA and KSI

	HLR	AK	EW	PA	PCRQ
HLR	1.000				
AK	0.826	1.000			
EW	0.596	0.492	1.000		
PA	0.864	0.714	0.515	1.000	
PCRQ	-0.094	-0.078	-0.056	-0.082	1.000

PSI

Note: This matrix is diagonal.

HLR	AK	EW	PA
0.991	0.318	0.645	0.253

Regression Matrix ETA on KSI (Standardized)

	PCRQ
HLR	-0.094
AK	-0.078
EW	-0.056
PA	-0.082

!HLR Model: LISREL Run 2

Completely Standardized Solution

LAMBDA-Y

	HLR	AK	EW	PA
hlrY2a	0.439	- -	- -	- -
hlrY3a	0.366	- -	- -	- -
ak6Y19	- -	0.976	- -	- -
ak7Y20	- -	0.848	- -	- -
ak9Y22	- -	0.895	- -	- -
ak10Y23	- -	0.716	- -	- -
ew11Y34	- -	- -	0.475	- -
ew12Y35	- -	- -	0.525	- -
ew24Y38	- -	- -	0.510	- -
pa14Y25	- -	- -	- -	0.814
pa15Y26	- -	- -	- -	0.867
pa16Y27	- -	- -	- -	0.368

LAMBDA-X

	PCRQ
pcr17X2	0.686
pcr19X4	0.872
pcr20X5	0.941
pcr21X6	0.987

BETA

	HLR	AK	EW	PA
HLR	- -	- -	- -	- -
AK	0.826	- -	- -	- -
EW	0.596	- -	- -	- -
PA	0.864	- -	- -	- -

GAMMA

	PCRQ
HLR	-0.094
AK	- -
EW	- -
PA	- -

Correlation Matrix of ETA and KSI

	HLR	AK	EW	PA	PCRQ
HLR	1.000				
AK	0.826	1.000			
EW	0.596	0.492	1.000		
PA	0.864	0.714	0.515	1.000	
PCRQ	-0.094	-0.078	-0.056	-0.082	1.000

PSI

Note: This matrix is diagonal.

HLR	AK	EW	PA
0.991	0.318	0.645	0.253

THETA-EPS

hlrY2a	hlrY3a	ak6Y19	ak7Y20	ak9Y22	ak10Y23
0.808	0.866	0.048	0.282	0.199	0.487

THETA-EPS (continued)

ew11Y34	ew12Y35	ew24Y38	pa14Y25	pa15Y26	pa16Y27
0.774	0.724	0.740	0.337	0.248	0.865

THETA-DELTA

pcr17X2	pcr19X4	pcr20X5	pcr21X6
0.529	0.240	0.115	0.025

Regression Matrix ETA on KSI (Standardized)

	PCRQ
HLR	-0.094
AK	-0.078
EW	-0.056
PA	-0.082

Total and Indirect Effects

Total Effects of KSI on ETA

	PCRQ
HLR	-0.094
	(0.050)
	-1.903
AK	-0.078
	(0.041)
	-1.925
EW	-0.056
	(0.033)
	-1.725
PA	-0.082
	(0.043)
	-1.891

Indirect Effects of KSI on ETA

	PCRQ
HLR	- -
AK	-0.078
	(0.041)
	-1.925
EW	-0.056
	(0.033)
	-1.725
PA	-0.082
	(0.043)
	-1.891

Total Effects of ETA on ETA

	HLR	AK	EW	PA
HLR	- -	- -	- -	- -
AK	0.826	- -	- -	- -
	(0.103)			
	7.987			
EW	0.596	- -	- -	- -
	(0.138)			
	4.305			
PA	0.864	- -	- -	- -
	(0.108)			
	7.977			

Largest Eigenvalue of B*B' (Stability Index) is 1.783

Total Effects of ETA on Y (continued)

	HLR	AK	EW	PA
hlrY2a	0.439	- -	- -	- -
hlrY3a	0.366	- -	- -	- -
	(0.054)			
	6.728			
ak6Y19	0.806	0.976	- -	- -
	(0.101)			
	7.987			
ak7Y20	0.700	0.848	- -	- -
	(0.093)	(0.069)		
	7.537	12.216		
ak9Y22	0.739	0.895	- -	- -
	(0.091)	(0.052)		
	8.134	17.240		
ak10Y23	0.592	0.716	- -	- -
	(0.077)	(0.051)		
	7.637	13.940		
ew11Y34	0.283	- -	0.475	- -
	(0.066)			
	4.305			
ew12Y35	0.313	- -	0.525	- -
	(0.060)		(0.126)	
	5.192		4.173	
ew24Y38	0.304	- -	0.510	- -
	(0.060)		(0.113)	
	5.036		4.505	
pa14Y25	0.704	- -	- -	0.814
	(0.088)			
	7.977			
pa15Y26	0.749	- -	- -	0.867
	(0.092)			(0.069)
	8.118			12.575
pa16Y27	0.318	- -	- -	0.368
	(0.066)			(0.060)
	4.838			6.089

Indirect Effects of ETA on Y

	HLR	AK	EW	PA
hlrY2a	- -	- -	- -	- -
hlrY3a	- -	- -	- -	- -
ak6Y19	0.806	- -	- -	- -
	(0.101)			
	7.987			
ak7Y20	0.700	- -	- -	- -
	(0.093)			
	7.537			
ak9Y22	0.739	- -	- -	- -
	(0.091)			
	8.134			
ak10Y23	0.592	- -	- -	- -
	(0.077)			
	7.637			
ew11Y34	0.283	- -	- -	- -
	(0.066)			
	4.305			
ew12Y35	0.313	- -	- -	- -
	(0.060)			
	5.192			

ew24Y38	0.304 (0.060) 5.036	- -	- -	- -
pa14Y25	0.704 (0.088) 7.977	- -	- -	- -
pa15Y26	0.749 (0.092) 8.118	- -	- -	- -
pa16Y27	0.318 (0.066) 4.838	- -	- -	- -

Total Effects of KSI on Y

	PCRQ
hlrY2a	-0.041 (0.022) -1.903
hlrY3a	-0.035 (0.018) -1.900
ak6Y19	-0.076 (0.040) -1.925
ak7Y20	-0.066 (0.034) -1.932
ak9Y22	-0.070 (0.036) -1.915
ak10Y23	-0.056 (0.029) -1.932
ew11Y34	-0.027 (0.015) -1.725
ew12Y35	-0.030 (0.016) -1.879
ew24Y38	-0.029 (0.016) -1.839
pa14Y25	-0.066 (0.035) -1.891
pa15Y26	-0.071 (0.037) -1.916
pa16Y27	-0.030 (0.016) -1.847

Standardized Total and Indirect Effects

Standardized Total Effects of KSI on ETA

	PCRQ
HLR	-0.094
AK	-0.078
EW	-0.056
PA	-0.082

Standardized Indirect Effects of KSI on ETA

	PCRQ
HLR	- -
AK	-0.078
EW	-0.056
PA	-0.082

Standardized Total Effects of ETA on ETA

	HLR	AK	EW	PA
HLR	- -	- -	- -	- -
AK	0.826	- -	- -	- -
EW	0.596	- -	- -	- -
PA	0.864	- -	- -	- -

Standardized Total Effects of ETA on Y (continued)

	HLR	AK	EW	PA
hlrY2a	0.439	- -	- -	- -
hlrY3a	0.366	- -	- -	- -
ak6Y19	0.806	0.976	- -	- -
ak7Y20	0.700	0.848	- -	- -
ak9Y22	0.739	0.895	- -	- -
ak10Y23	0.592	0.716	- -	- -
ew11Y34	0.283	- -	0.475	- -
ew12Y35	0.313	- -	0.525	- -
ew24Y38	0.304	- -	0.510	- -
pa14Y25	0.704	- -	- -	0.814
pa15Y26	0.749	- -	- -	0.867
pa16Y27	0.318	- -	- -	0.368

Completely Standardized Total Effects of ETA on Y

	HLR	AK	EW	PA
hlrY2a	0.439	- -	- -	- -
hlrY3a	0.366	- -	- -	- -
ak6Y19	0.806	0.976	- -	- -
ak7Y20	0.700	0.848	- -	- -
ak9Y22	0.739	0.895	- -	- -
ak10Y23	0.592	0.716	- -	- -
ew11Y34	0.283	- -	0.475	- -
ew12Y35	0.313	- -	0.525	- -
ew24Y38	0.304	- -	0.510	- -
pa14Y25	0.704	- -	- -	0.814
pa15Y26	0.749	- -	- -	0.867
pa16Y27	0.318	- -	- -	0.368

Standardized Indirect Effects of ETA on Y

	HLR	AK	EW	PA
hlrY2a	- -	- -	- -	- -
hlrY3a	- -	- -	- -	- -
ak6Y19	0.806	- -	- -	- -
ak7Y20	0.700	- -	- -	- -
ak9Y22	0.739	- -	- -	- -
ak10Y23	0.592	- -	- -	- -
ew11Y34	0.283	- -	- -	- -
ew12Y35	0.313	- -	- -	- -
ew24Y38	0.304	- -	- -	- -
pa14Y25	0.704	- -	- -	- -
pa15Y26	0.749	- -	- -	- -
pa16Y27	0.318	- -	- -	- -

Completely Standardized Indirect Effects of ETA on Y

	HLR	AK	EW	PA
hlrY2a	- -	- -	- -	- -
hlrY3a	- -	- -	- -	- -
ak6Y19	0.806	- -	- -	- -
ak7Y20	0.700	- -	- -	- -
ak9Y22	0.739	- -	- -	- -
ak10Y23	0.592	- -	- -	- -
ew11Y34	0.283	- -	- -	- -
ew12Y35	0.313	- -	- -	- -
ew24Y38	0.304	- -	- -	- -
pa14Y25	0.704	- -	- -	- -
pa15Y26	0.749	- -	- -	- -
pa16Y27	0.318	- -	- -	- -

Standardized Total Effects of KSI on Y

	PCRQ
hlrY2a	-0.041
hlrY3a	-0.035
ak6Y19	-0.076
ak7Y20	-0.066
ak9Y22	-0.070
ak10Y23	-0.056
ew11Y34	-0.027
ew12Y35	-0.030
ew24Y38	-0.029
pa14Y25	-0.066
pa15Y26	-0.071
pa16Y27	-0.030

Completely Standardized Total Effects of KSI on Y

	PCRQ
hlrY2a	-0.041
hlrY3a	-0.035
ak6Y19	-0.076
ak7Y20	-0.066
ak9Y22	-0.070
ak10Y23	-0.056
ew11Y34	-0.027
ew12Y35	-0.030
ew24Y38	-0.029
pa14Y25	-0.066
pa15Y26	-0.071
pa16Y27	-0.030

Time used: 0.328 Seconds